User's Guide

v2.1

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1 Introduction

Thank you for choosing add4Q! The constant pursuit of improvement is an important part of our philosophy. Motivated by these considerations we developed add4Q, offering you a quick and efficient way of completing projects according to a proven process.

add4Q will perfectly support you in requirement engineering, thus helping to accelerate the process from requirements to final product. One of the strengths of add4Q is its intuitive usability merely requiring that you accept structured project development such as the classic V model. Therefore, regardless of whether you already have experience in requirement engineering or not, you will achieve success even on the first day and realize an increase in productivity.

add4Q helps you create the project structure, requirements and test cases, it checks and visualizes whether requirements and test cases are linked over the development levels and the add4Q||reviewer ensures a valid product file with up-to-date documents at the end of the project.

We hope you enjoy working with add4Q and Enterprise Architect and wish you a lot of success!

2 add4Q Toolkit environment

The add4Q Toolkit aims to accompany and support project development goal-oriented with Enterprise Architect as defined by the V model on all levels of development. The Toolkit consists of a total of six plug-ins that simplify development processes such as document processing, requirement management, test management and review management continuously in the UML modeling tool Enterprise Architect.

The add4Q features aim to support a consistent and structured approach of development teams in their project environment. To store their used information, the plug-ins exclusively revert to the Enterprise Architect repository.

2.1 Enterprise Architect and add4Q – a very good combination

Due to its various possibilities as UML modeling tool, Enterprise Architect provides an excellent platform for structured software development as defined by the V model. Wide distribution, a very good price-performance ratio and the open interface for commercial and user-specific extensions ensure long-term reliability.

The combination of Enterprise Architect with the basic characteristics

- use of a single repository
- easy use of the UML notation on all levels
- scalability for small and large projects
- support for version control

in connection with the add4Q Toolkit allows in addition:

- easy document management
- consistent requirement engineering
- reliable test planning
- and well-structured team reviews

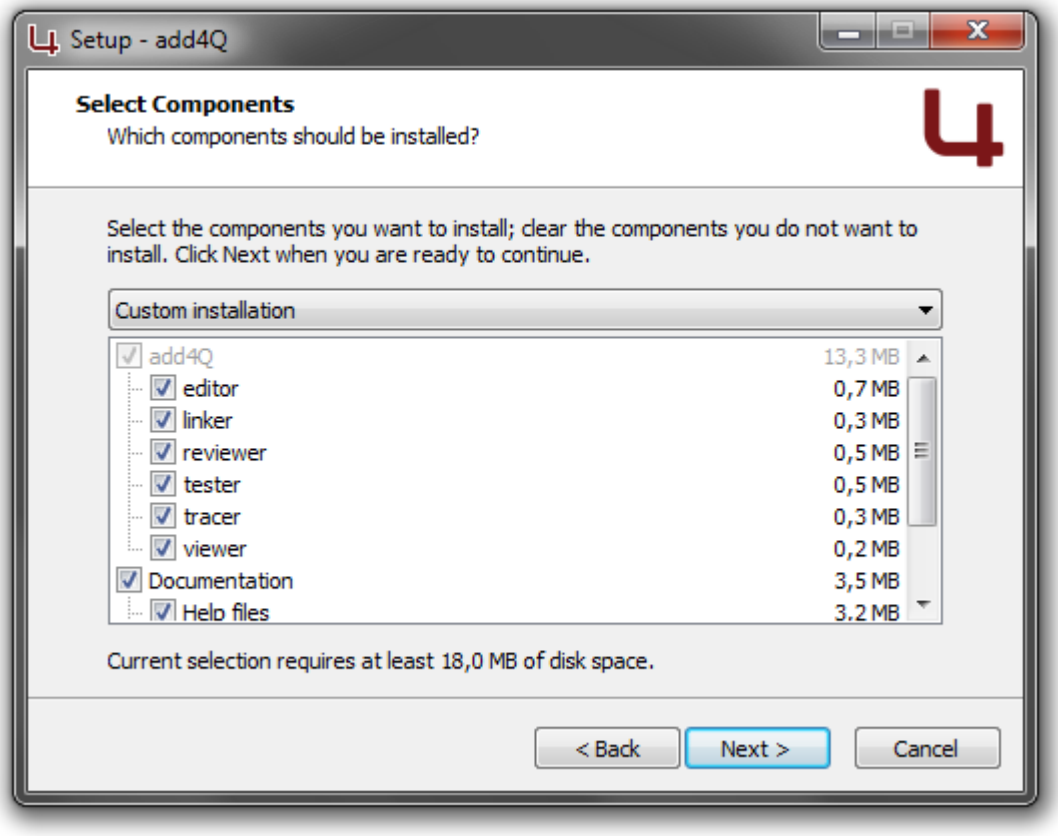
3 Installation

System requirements
add4Q requires no special hardware or software facilities but a PC with installed

- Microsoft Windows operating system Windows XP/SP3 or higher
- Microsoft .NET Framework 4.0
- Enterprise Architect 8.0 or later
- Microsoft Office 2003 or later (only required for document export)

and the system configuration recommended by Microsoft and Sparx Systems or better.

Installation
Please download the latest version of add4Q from our website before you start installation. add4Q is offered as an executable file (Setup.exe). After accessing Setup.exe you will be guided through installation by a graphical installation routine.


Setup - add4Q
Select Components
Which components should be installed?
Select the components you want to install; clear the components you do not want to install. Click Next when you are ready to continue.
Custom installation
add4Q 13,3 MB
editor 0,7 MB
linker 0,3 MB
reviewer 0,5 MB
tester 0,5 MB
tracer 0,3 MB
viewer 0,2 MB
Documentation 3,5 MB
Help files 3.2 MB
Current selection requires at least 18,0 MB of disk space.
< Back
Next >
Cancel

Component selection in the installation dialog

During installation, you will have the option of selecting individual components. We recommend you to always install all elements because as developer or tester you need to link, for example, also test cases to requirements. Since add4Q is licensed as a complete package only, there are no more licenses available if you do not install single components.

4 Licensing

add4Q is licensed for 30 days after installation and can be used without restriction. As a consequence, when starting Enterprise Architect, a dialog will appear which allows you to carry out licensing or continue to use the software in demo mode. The alternatives in detail:

Dialog for product activation

Demo license
The software can be used for 30 days without restriction. All generated requirements, test cases, properties, notes etc. are stored in the EA repository and can still be used, even without add4Q.

Single-user license
Single-user licenses are tied to the computer from which the activation key is requested. You need your customer or order number for the request.
Activation is divided in two steps. A click on the "Request key" button opens a dialog box for entering the customer or order number. After entry, an e-mail will be generated containing the customer information and a security code.

Do not modify that information. The activation key will be sent to the sender's e-mail address.
For activation, you click on the "Import key" button and copy the license key into the input field. Activation is now completed.

Note: If you need to install add4Q to another computer, you need a new license key!

Floating license:
With a floating license, you will receive a license file which can be stored on any computer or server that is accessible on the network. For activation, you just enter the path to the license file. A license is then checked out on the server, being available as long as the application is running and a network connection

exists.

Floating licenses allow different users to use the same licenses. This saves costs if not all users use the software at the same time, and facilitates license management.

5 Overview of the features

The following section provides a short description of the main features and functions of the modules.

5.1 Document processing

The **add4Q||editor** plug-in offers the following options for document processing:

Document storage in the repository
Documents can easily be created or edited; all document artifacts are stored in the EA repository as notes, linked documents, requirements, test cases etc.

Conversion of packages
Existing packages can be converted by the add4Q||editor into documents for further processing.

Automatic numbering
Hierarchical document and chapter numbering is automatically created.

Formatting
Document contents such as headlines, texts, tables, graphs, references and requirements are easily editable.

Document attributes
Each document is tagged/provided with attributes like author, version etc.; these attributes are stored as "tagged values".

Properties
Each element of a document can be tagged with characteristics such as risk level, priorities etc. which are stored in the EA repository as properties.

Document export
All documents generated with add4Q can be printed in MS Word format as *.doc/*.docx file, as RTF file or in HTML format. Generation can be done with Word templates (*.dot/*.dotx) so that the documents meet their corporate standard.

Document overview
An overview (list) of all managed documents with their versions can be generated at the push of a button.

5.2 Requirement management

Requirement management is realized in the **add4Q||tracer, add4Q||linker** and **add4Q||viewer** modules and offers the following options:

Development levels
Mapping and creation of project-specific package structure in the EA repository to development levels such as requirements (0), functional description (1) and design (2).

Links
Simple linking of requirements, elements of implementation and description chapters on the development levels.

Graphical view
The add4Q||viewer provides a graphical view of all links of the active element. Thus, one can easily trace one requirement on the levels and, at the same time, see the associated test cases.

Check for completeness
Check for completeness of links between requirements, test cases and realizing artifacts. Check can be made on the development levels or in individual documents.

Summary
Generation of a document or trace report, including a summary of all existing and missing links.

5.3 Test planning

The **add4Q||tester** plug-in offers the following options:

Test specification
Creation of test specifications for the definition of test cases.

Link
Link between test cases, requirements and objects of implementation.

Test plans
Creation of test plans in accordance with the underlying test specification and entry of test results.

Report generation
Output of test specifications and test plans to prove test coverage and execution with results logging.

5.4 Review management

The **add4Q||reviewer** plug-in provides the possibility to check and release documents of any type in a specified sequence.

Pre-review phase
Every participant looks through the document to be reviewed and makes notes, if necessary.

Review phase
All review participants view the document and the pre-review notes.

Correction phase
The author updates the document according to the corrections made during the review.

Examination phase
The release manager examines the changes and releases the document. For the release, it is possible to provide documents with a digital signature.

6 Guideline for the preparation and classification of projects

When creating a new EA project using the add4Q Toolkit, the following fundamental conditions should be observed in terms of a V model procedure.

Development levels
The structure of the project should be divided into several levels of development in which both the system requirements and the implementation are described. The number of development levels is not regulated. For small projects, for example, there may be one level on the request side, for larger projects there may be more levels that are broken down from the system level to component levels.

Requirements and tests
The requirements in the different levels of development are to be realized with requirement artifacts that spread through the levels by links until realization in classes or document sections in descriptions. According to the V model, all requirements are to be backed "horizontally" by test cases and tested in the relevant test specifications.

Document orientation
The structure of the project is document-oriented. Each level contains documents whose contents can be transferred to another document and saved at any time.

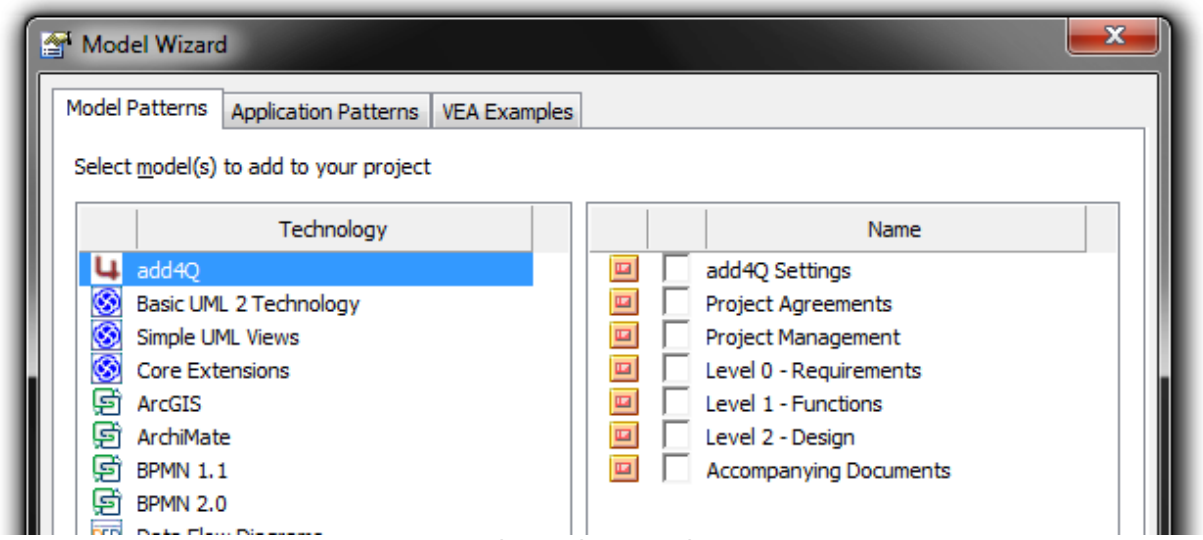
6.1 Preparation of a new project

To start a project, the first step should be to create a basic framework in the EA repository. This framework reflects all the necessary work steps and artifacts of the project, meets project needs in terms of the development levels planned and contains all necessary management structures.

After creating a new blank EA project, the following options are available:

Manual creation of the basic structure
All steps to create a new project structure are carried out manually using the add4Q plug-ins.

Use of the EA model wizard
By using the model wizard, a pre-assembled structure will be imported on the basis of a project example.



4plus project templates

Under the entry 4plus there are several freely combinable subprojects available to choose from, with prepared document structures. Documents that are not needed can be removed in the EA project browser.

6.1.1 Definition of development levels

Development levels are important structuring elements during the development process of a project. The project is described in each of these levels under a certain aspect. Here are a few examples of development levels:

Request level
On this level, the project is regarded from the perspective of customer requirements or product management. What do you expect from the system? In this respect, technical implementation is irrelevant or only of minor relevance.

Functional description level
Description from development point of view of how single requirements are to be technically implemented.

Design level
Description of the architecture, program structure and modules for the realization of functions.

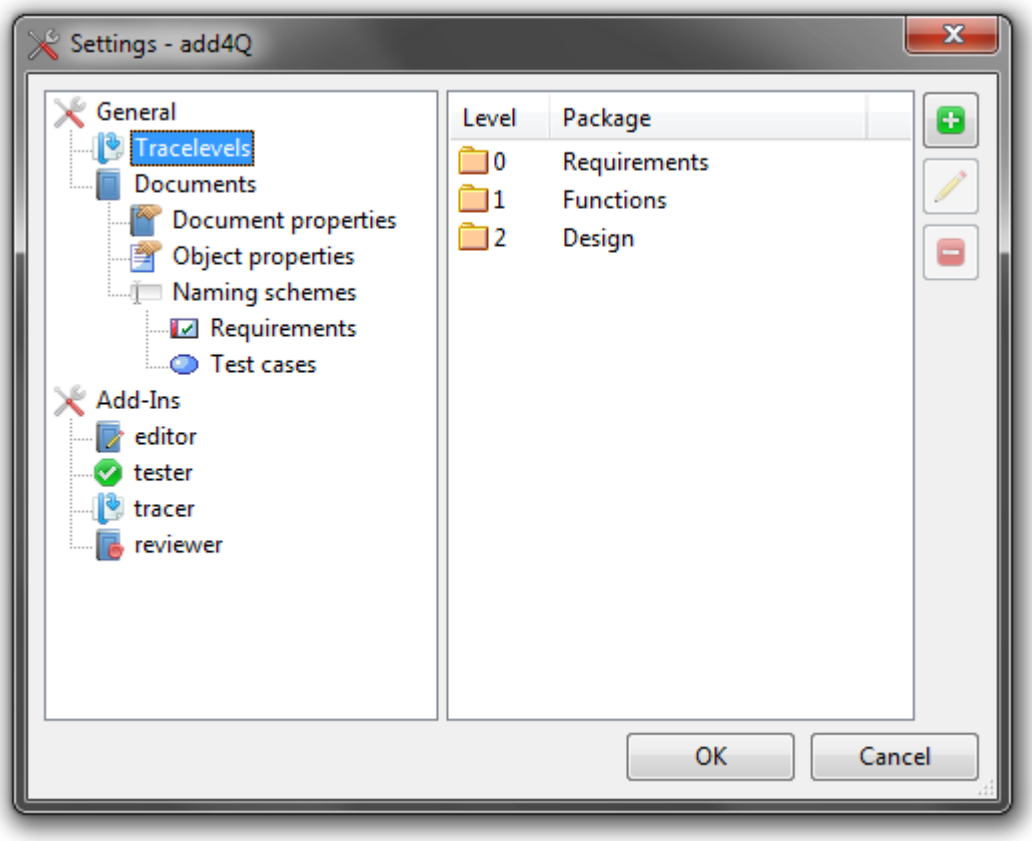
When using the add4Q Toolkit, it is important that on all description levels requirement artifacts are used for the traceability of individual requirements.

In vertical alignment, requirements are linked to requirements or to implementation elements such as classes or descriptive document sections.

In horizontal alignment, requirements and implementation artifacts are linked on any level to the corresponding test cases.

The project can be extended by any number of development levels. For example, by one level in which system requirements are broken down to component requirements.

Create the structure in the EA project
To create the different levels in the repository, open the configuration dialog via the menu item [Extensions/add4Q/Einstellungen] by entering "Trace level". The planned development levels can easily be created in this user interface by creating the required packages or selecting them from existing project structures.



Dialog for the creation of development levels (trace levels)

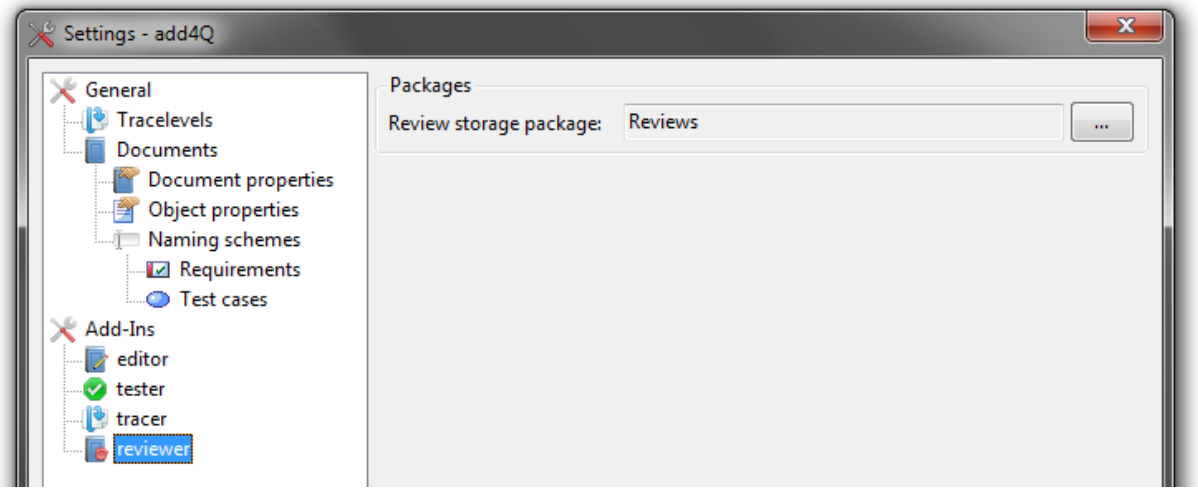
Impact on the EA repository:
There are packages created which are assigned to the "Level" category.

Note: Development levels must be created in the appropriate order according to the development process. add4Q assigns the levels unchangeably in that order. It is not possible to create all the levels in one pass. Confirm each defined level with OK.

6.1.2 Definition of the review protocol directory

The next step is the definition of a directory in which all review protocols are collected that will be created later on after the review and release of documents.

To create this directory, open the configuration dialog via the menu item [Extensions/add4Q/Settings] by entering "reviewer". There, you can accordingly create a directory under the section "review repository package".

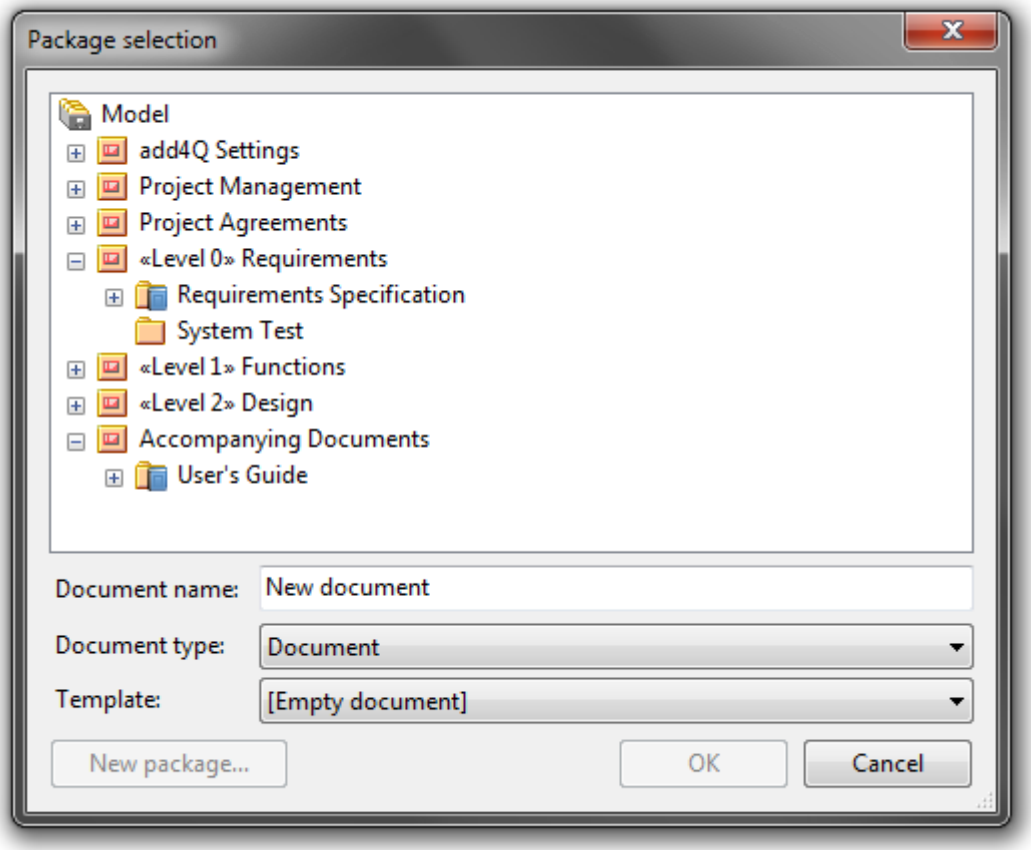


Dialog for the selection or creation of the review directory

Impact on the EA repository:
A package with the stereotype "Reviews" is created.

6.1.3 Definition of the proposed document structure

At this point, documents are created that are to be generated during the further course of the project. For this purpose, the "add4Q||editor" plug-in is started via the menu item [Extensions/add4Q/editor]. Via the icon "New document" the documents can then be created in order on different development levels.



Creation of a document structure

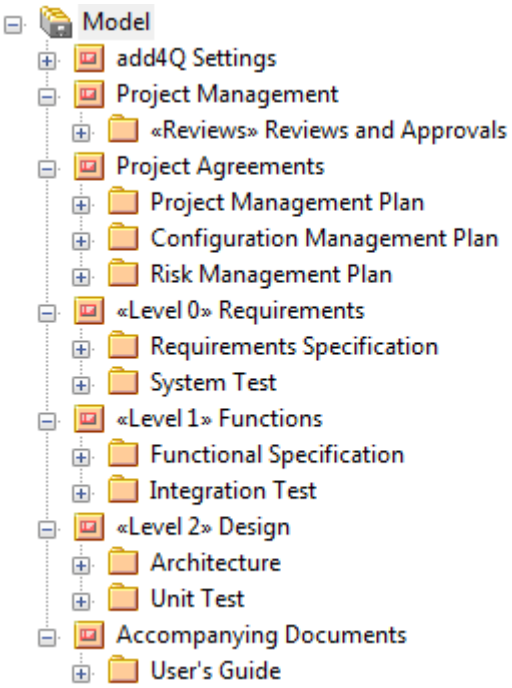
In addition to the development levels which have already been defined, it is often useful to create other directories containing documents without traceable information. For instance, a directory of project agreements containing a project management plan or a technical documentation directory containing a user

manual.

Impact on the EA repository:
A root package is generated for each new document, containing a number of "tagged values" with document variables such as title, author etc.

6.1.4 Review of project structure

At this point, it should be checked whether all required documents and directories have been created. The following figure shows a typical example of the basic structure of a project in the EA project browser.



Example of a project structure with created levels

In the course of the project it is, of course, always possible to add more documents.

6.2 Alternative procedure for creating a project structure

As an alternative to the presented scenario, the project structure can also be created by using supplied sample structures. Afterwards, this example can be adapted to the current project by deleting or adding development levels (see chapter Definition of development levels) or by deleting or creating individual documents (see chapter Definition of the proposed document structure).

6.3 Other program settings

It is advisable to look directly at the setting dialog and its contents more in detail and make the required settings. The add4Q program settings are accessed via the Extensions menu item or in the project browser via [Right mouse button / Extensions / add4Q / Settings]. You can also open the settings dialog via the plug-in windows using [add4Q / Settings].

General:

[Languages] add4Q is available in German and in English language.

[Document display] Here, you can change how document titles are displayed throughout the plug-ins. When created, documents are given a unique, three-digit identification number. The document type is provided by the user's document properties.
Example: If you want your documents displayed in a format like "[201] Functional specification - add4Q", you can enter a format like "[%id%] %type% - %title%".

[Miscellaneous] Options to show a splash screen on plug-in startup, project browser selection synchronization and display of stereotypes.

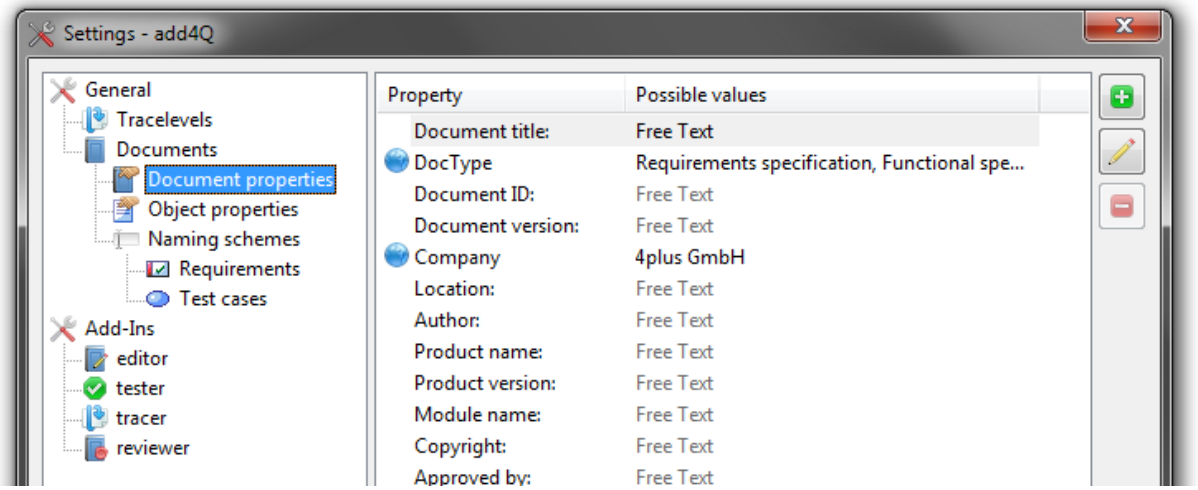
The type of document results from the document variables that were entered by the user; it can be indicated in the overview.

Trace level:

see chapter Definition of development levels

Document Properties:

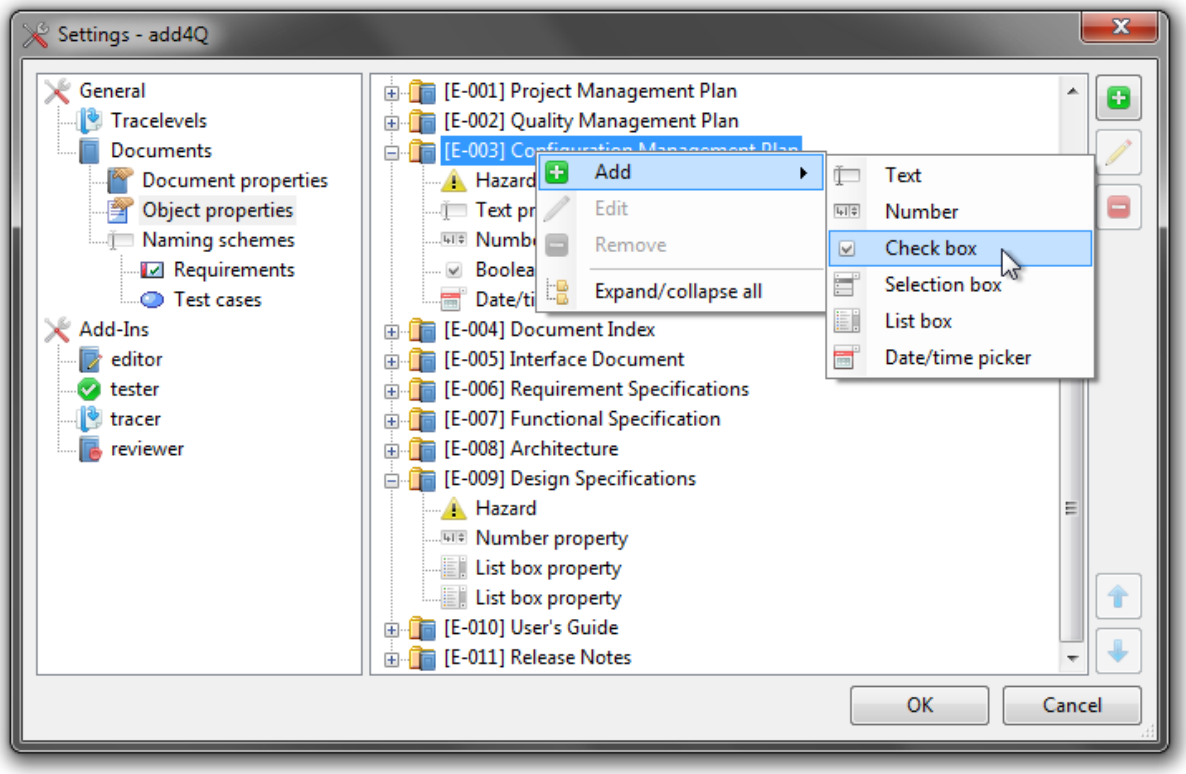
User defined document properties (e. g. author, title, version) can be assigned to each document. In the settings dialog, you can modify the attributes and their data types. Global values can also be assigned. Local values are modified in Editor. See Creating documents.



Document properties settings dialog

Object properties:

add4Q offers the possibility to provide elements in the project with defined properties, with those being set globally or document-specifically. In the context menu of the desired document, you choose the function required for setting the property. For instance, this may be a selection box to provide requirements, classes, test cases etc. with priorities or a list for the definition of product types for which this requirement is valid.

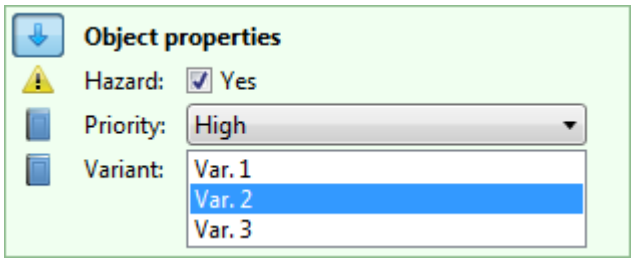


Settings dialog for document-specific properties

When you create a property, by activating the check boxes it will be defined in the description dialog for which elements of the document the property is effective. You can choose between artifacts, packages, classes, requirements and test cases.

The result in the document might look as shown below. At a glance, it is clear that the requirement does not hold risk potential, has high priority and is valid for all planned product types.

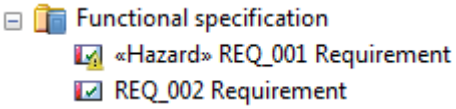
Note: if a document is opened while changing object properties, a refresh might be necessary to reflect the changes ([Edit / Refresh local model]).



Properties dialog in the document

In the document, property dialogs can be shown or hidden as and when required.

If an element is marked as hazard, the icon will be displayed on the relevant folder in the chapter overview.



Requirement with the "Hazard" property

When editing documents with many requirements and/or properties, it may be useful to switch to the matrix view ([View / Matrix view]), where all objects and properties are shown in a matrix-like dialog.

Naming schemes:

Naming conventions are little discussed project agreements, as certain standards have already been set up from actual practice. By using add4Q one can define a syntax which will be set automatically when creating requirements and test cases. For example: numbering_type_name. See chapter Use of name prefixes.

Already created documents are displayed here. By double-clicking on the desired document or by selecting a document and click on the "Edit" button the configuration dialog box will be opened for entering the naming convention. Naming schemes can be created for requirements and test cases and are valid document-specifically.

editor:

[Document templates] add4Q offers the possibility to save created documents as templates for the use in other projects. Specify the path where you want to store document templates. Template files are stored in XML format.

[Font] Enter your default font for creating documents.

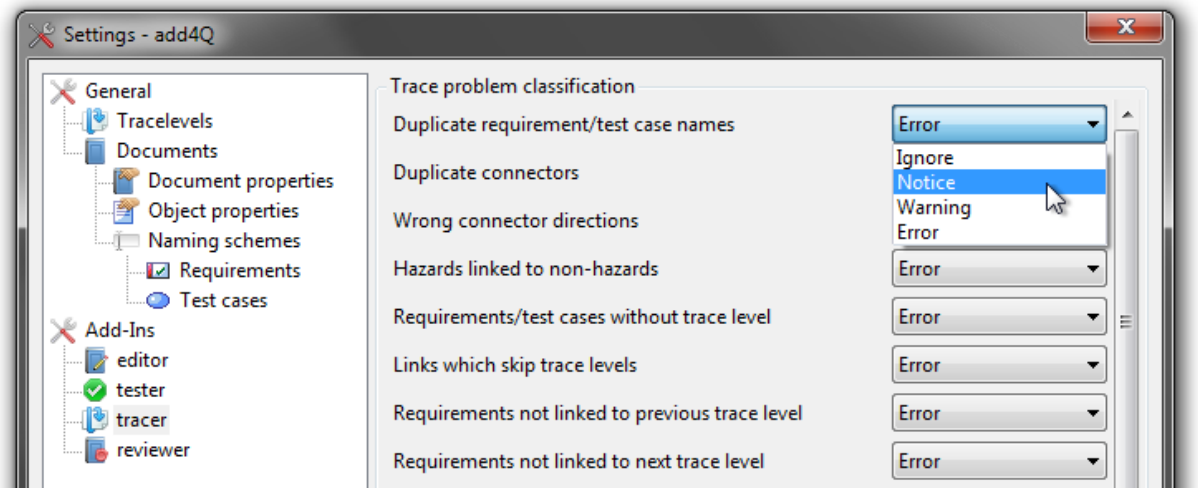
[Miscellaneous] Checkboxes for retrieving the latest version of a document from version control when opening a document, the display of notes and auto-save interval.

tester:

[Miscellaneous] Activate the checkbox to retrieve the latest version of a document from version control when opening a document.

tracer:

When creating or linking traceable elements, errors and omissions can happen. For each error class it can be specified in the tracer dialog how this class is rated. See also Classification of trace problems.



Settings dialog for trace output

In the tracer output results can be filtered according to the settings by selecting the desired icon for information ( ), warning ( ) or error ( ).

reviewer:

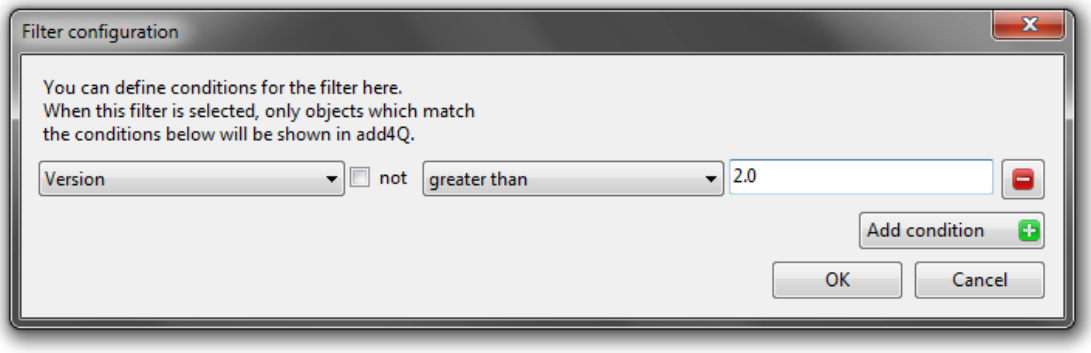
Option to choose the package where review protocols will be stored (see also Definition of the review protocol directory).

6.4 Using Filters

You can define global filters using the [add4Q/Filter settings...] menu item. Filters are used to restrict the types of objects that are visible throughout the plug-ins. You can combine filters and create filters using multiple conditions.

For example, you could create a filter that only shows objects with a version greater than 2.0. For doing so, press the "plus"-button to create a new filter. The filter configuration dialog is opened automatically. Now you just have to select "Version" and "greater than" in the drop down boxes on the left and enter "2.0" as the value (See Filter configuration). If you additionally want only requirements to be shown, you can either add another condition to the filter or create a new filter altogether. After confirmation, any objects which aren't a requirement with a version higher than 2.0 will be invisible throughout the plug-ins.

There is also the possibility to apply a filter to only one plug-in window locally. If you want to do so, select the [add4Q/Local filters] menu item in the plug-in window.

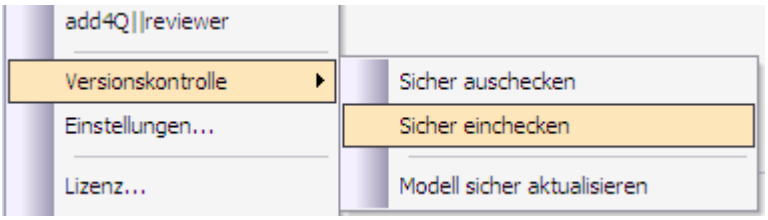


Filter configuration

6.5 Version control usage

The advantages of VC systems are well known, the implementation of EA-supported version control systems is described in detail in the EA online help. add4Q is set up for use with the EA-supported VC systems.

The VC functions for checking in and out and for updating the model are opened from the context menu "Extensions/add4Q/version control" of the EA project browser.



Context menu of version control

Among the add4Q menu items [Edit] and in the toolbar you will find the entries / icons for updating of the local model or updating from version control.

Icons for refreshing

7 Working with single plug-ins

In the following chapter, a possible approach to project work with the add4Q Toolkit is described by way of examples. add4Q does not force you to do things in a certain order or work in rigid sequences. However, it clearly shows you at any time what remains to be done. You are free to do it according to your "best-practice" experience, the V model approach or with methods of agile development.

7.1 Document processing

The central application from which everything proceeds and where in the end everything reconvenes, is the add4Q||editor.

7.1.1 Representation of documents in the EA repository

The add4Q plug-ins manage documents in the repository under a fixed structure and with defined EA artifacts.

Document root:
A package that can be stored anywhere in the repository. This package contains a number of "tagged values" with document properties such as author, version etc. of the document.

Document content:
Subchapter:
Packages that are arranged hierarchically under the root package, containing notes as well as linked documents.

Requirements:
EA requirement objects with notes and linked documents.

Diagrams:
EA diagram objects which are displayed in the add4Q||editor but cannot be edited.

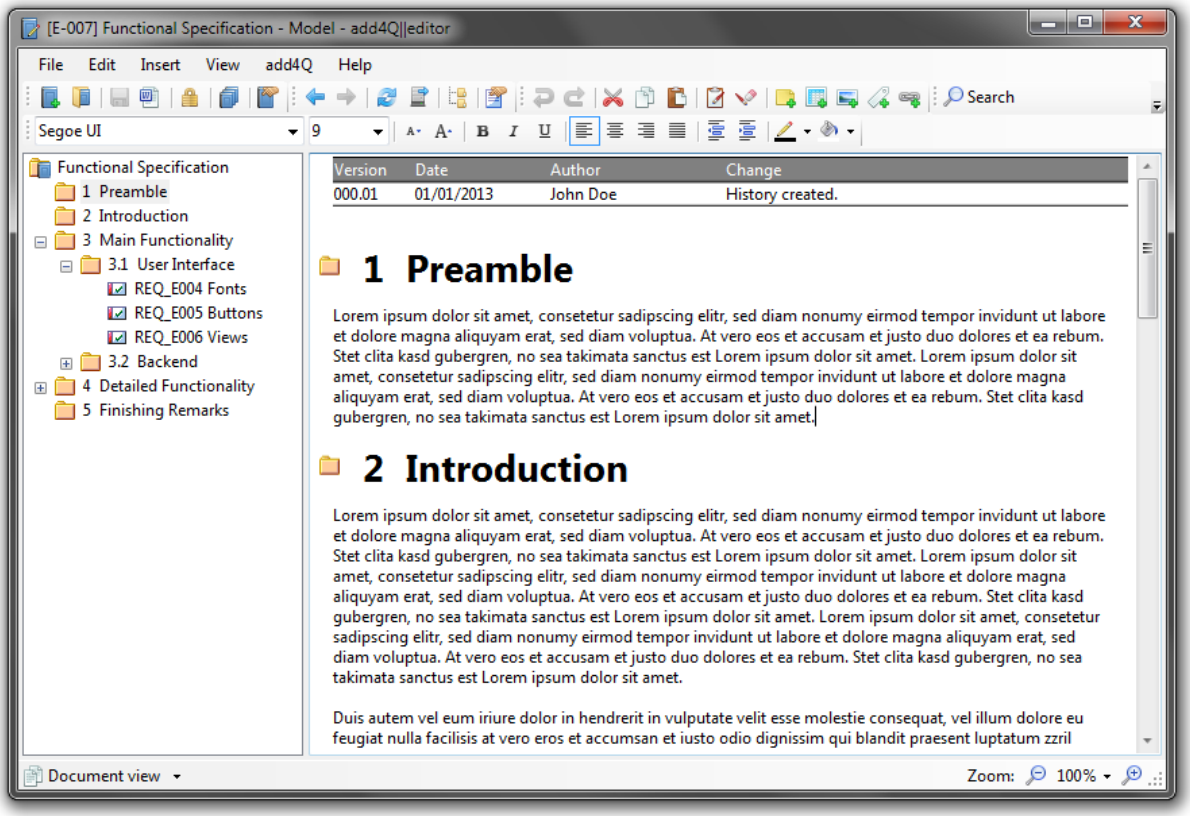
Document artifacts:
EA document artifacts that can be created under packages.

Note: contrary to normal text, artifacts can be linked, for example, with requirements or realizing classes.

Note: in order to ensure consistent object sorting between the EA project browser and add4Q, "Allow Free Sort" should be enabled in the EA options dialog ([Tools / Options / General]).

7.1.2 add4Q||editor window structure

To start editing documents, select the EA menu item [Extensions/add4Q/editor].


[E-007] Functional Specification - Model - add4Q||editor
File Edit Insert View add4Q Help
Search
Segoe UI 9
Functional Specification
1 Preamble
2 Introduction
3 Main Functionality
3.1 User Interface
REQ_E004 Fonts
REQ_E005 Buttons
REQ_E006 Views
3.2 Backend
4 Detailed Functionality
5 Finishing Remarks
Version Date Author Change
000.01 01/01/2013 John Doe History created.
1 Preamble
Lorem ipsum dolor sit amet, consetetur sadipscing elitr, sed diam nonumy eirmod tempor invidunt ut labore et dolore magna aliquyam erat, sed diam voluptua. At vero eos et accusam et justo duo dolores et ea rebum. Stet clita kasd gubergren, no sea takimata sanctus est Lorem ipsum dolor sit amet. Lorem ipsum dolor sit amet, consetetur sadipscing elitr, sed diam nonumy eirmod tempor invidunt ut labore et dolore magna aliquyam erat, sed diam voluptua. At vero eos et accusam et justo duo dolores et ea rebum. Stet clita kasd gubergren, no sea takimata sanctus est Lorem ipsum dolor sit amet.
2 Introduction
Lorem ipsum dolor sit amet, consetetur sadipscing elitr, sed diam nonumy eirmod tempor invidunt ut labore et dolore magna aliquyam erat, sed diam voluptua. At vero eos et accusam et justo duo dolores et ea rebum. Stet clita kasd gubergren, no sea takimata sanctus est Lorem ipsum dolor sit amet. Lorem ipsum dolor sit amet, consetetur sadipscing elitr, sed diam nonumy eirmod tempor invidunt ut labore et dolore magna aliquyam erat, sed diam voluptua. At vero eos et accusam et justo duo dolores et ea rebum. Stet clita kasd gubergren, no sea takimata sanctus est Lorem ipsum dolor sit amet. Lorem ipsum dolor sit amet, consetetur sadipscing elitr, sed diam nonumy eirmod tempor invidunt ut labore et dolore magna aliquyam erat, sed diam voluptua. At vero eos et accusam et justo duo dolores et ea rebum. Stet clita kasd gubergren, no sea takimata sanctus est Lorem ipsum dolor sit amet.
Duis autem vel eum iriure dolor in hendrerit in vulputate velit esse molestie consequat, vel illum dolore eu feugiat nulla facilisis at vero eros et accumsan et iusto odio dignissim qui blandit praesent luptatum zzril
Document view
Zoom: 100%

View of the add4Q||editor user interface

The add4Q||editor window is divided into two panes:

- Document structure pane
On the left side of the window an outline will be displayed, with subchapters, requirements and document artifacts.

- Document details pane
The right side contains the editor with coherent document contents**.**

Library
An overview of all project documents is available under the [file/open] dialog. Sorting is done corresponding to the selection in the settings dialog, either in alphabetical order or according to the preceding document identification number.

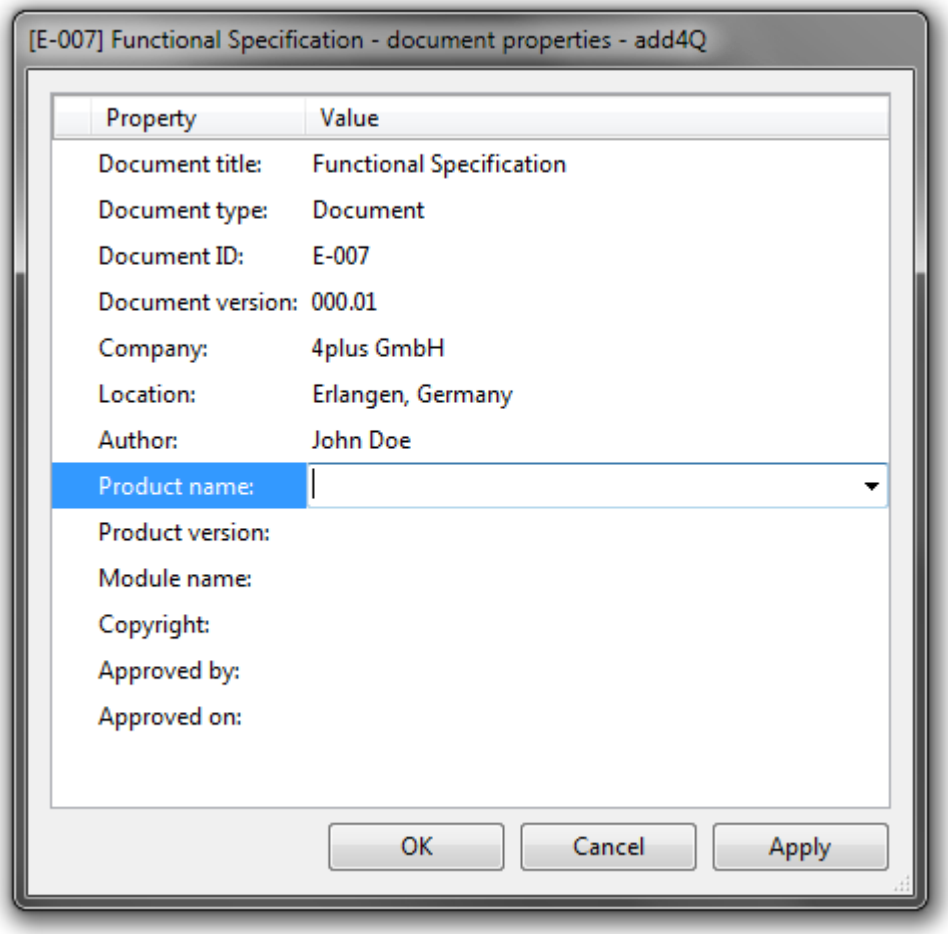
7.1.3 Creating documents

Create a new document
A new document is created via selecting the icon "New document" or the menu item [file/new document].

Define destination
After entering the destination package and the document name, a new document root is created at the selected position in the repository. At the beginning, each new document contains a history table for the management of the change history. This table can be continued manually by the editor.

Template
Each document created with add4Q can be saved as template in XML format. This allows to adjust templates easily with user-specific elements and formatting (cover sheet, logo etc.). New documents can now also be created by using the desired template.

Editing of document attributes
Document properties can be adjusted by selecting the menu item [Edit/document variables] or the appropriate icon in the toolbar.



Dialog for editing document variables

Document version:
If a document was released during the review process, a new version of the document will automatically be created and a corresponding entry will be added. The released document is frozen in the repository and no longer editable.

7.1.4 Editing of the document structure

The document structure is edited in the document structure pane.

Add chapters on top level
Right mouse click on empty screen area / add chapter.

Insert subchapters
Select chapter icon, right mouse click / insert chapter.

Insert document artifacts
Select chapter icon, right mouse click / insert artifact. Artifacts are preceded by a special symbol in the structure.

Insert requirements
Select chapter icon, right mouse click / insert requirement. Requirements are preceded by a special symbol in the structure.

Note: When creating the first requirement for a document, the configuration dialog will be opened for defining the naming syntax if the checkbox is activated (default) under [add4Q/settings].

Move elements

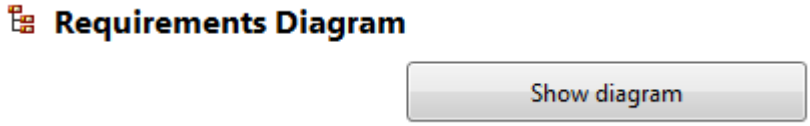
Select the element icon, left mouse click and move to the desired position.

Delete elements
Select the icon and click the delete key or select "Delete" in the context menu.

Delete notes
A note will be deleted by deleting the text and saving the document. With the next update of the document the note will be removed.

Note: Only notes created by the user can be deleted except for those related to requirements.

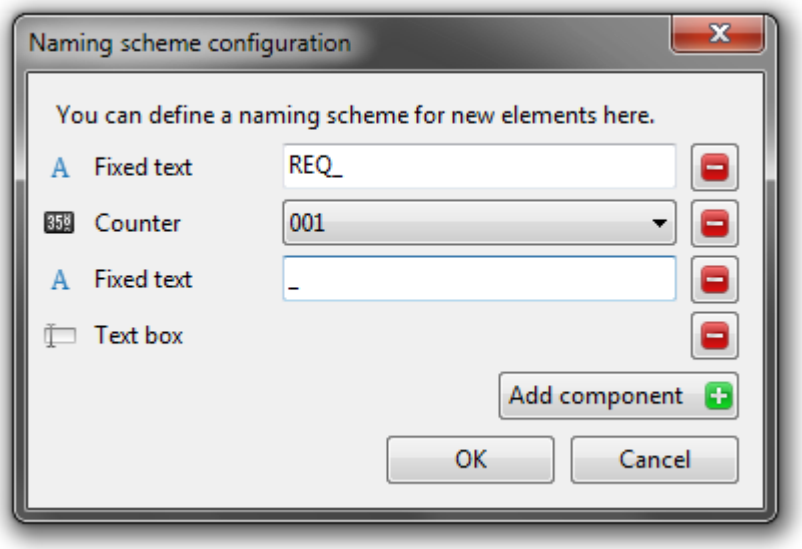
Insert UML diagrams
To use UML diagrams in add4Q documents you create the desired diagram in the EA project browser or drag an existing diagram to the chapter where it is needed. In the editor, a button to show the diagram will be displayed after the document has been refreshed.



UML diagram in the add4Q editor

7.1.5 Use of name prefixes

It goes without saying that strict naming conventions are obeyed in a project. add4Q helps you by offering the possibility to define pre- or postfixes for requirements and test cases which will be put automatically in front of or after the actual name. When a requirement or test case is first created, a configuration dialog opens to define the prefix syntax.



Naming scheme configuration dialog for requirements and test cases

If one creates a syntax as above in the screenshot, the result would look like:
001_SA_requirement name

The counter automatically increments the requirements. It is possible to change the value manually.
SA was set as fixed text and the text box used for naming.
Consequently, every time a requirement or test case is being created in the application, a dialog box appears showing the serial number and the fixed text in which the user still adds the name.

The configuration is saved with the document. This means that the person who creates the first requirement, also defines the syntax and needs to know the naming conventions.

Subsequent modifications and extensions are possible. For this purpose, you open the settings dialog [Extensions/add4Q/settings/naming schemes] and select the document in which changes are to be made. A double-click on the desired document opens the configuration dialog.

Note: Please note that changes do **not** affect already created requirements.

7.1.6 Edit text contents

After the creation of chapters, document artifacts and requirements, these are shown as headings in the *document detail window*. In order to enter text, one puts the cursor under the heading of chapters and artifacts, with requirements under the applied notes field, and starts typing.

Formatting of text contents in linked documents
In the toolbar, the usual formatting options such as font, size, color, alignment etc. are provided.

Insert images
In the text entry field, image files, graphics, screenshots etc. can be inserted. The size can be adjusted by moving the handle right at the bottom into the desired direction. Push the shift key to keep the proportions. add4Q provides no further image editing tools.

Insert tables
Tables can be inserted by clicking the icon "Insert table" and entering the number of columns and lines needed in the following dialog. Additional lines and columns can be added by marking a line or column and selecting the desired action in the context menu. The formatting options for tables are limited to column width, color and text formatting.

The line height is defined by the font size. Formulas and calculations cannot be executed or made.

Insert labels
Labels can be created for tables and graphics by clicking the icon and selecting in the following dialog whether the caption will be created for a graphic or a table. The text entered will be inserted at the relevant point of the document.

Insert links or references to tables and graphics
The labels are stored in a table for further use. This allows you to refer to previously inserted tables and graphics at any point in the document. Select the required label under the menu item [Insert/insert link] to link it to the element.

Insert references to document chapters
References to document chapters are inserted at the current cursor position in the document details pane by dragging and dropping the desired chapter into the document navigation window.

Position cursor on object referred to
By pushing the <CTRL key> and clicking on the reference, the cursor will be positioned on the corresponding chapter / table / image.

Insert notes
Notes are standard elements of EA artifacts with limited formatting option. They appear as a yellow field. In add4Q, we use notes as standard element for requirements as they allow us to place a short key information which will be visible at other points (e.g. in the viewer) by mouse-over.

Search
By means of the search function one can search the document starting from the cursor position, optionally forward or backward, by clicking on the corresponding icon. You can search for whole words or strings.

Search and replace
The dialog for [Search and replace] is reached via the [Edit] menu. The search function can be used case-sensitive and for whole words or syllables. Search results are gone through step by step, replacements are made by the user after confirmation.

7.1.7 Edit requirements

Requirements are presented in the document structure pane with a specific icon and semantically match the description of a requirement. The contents can be edited, as described in chapter Edit text contents. Subchapters or document artifacts cannot be created for requirements.

7.1.8 Generate documents

Via the menu item [File/export file] or by selecting the icon, the active document can be issued for external use. Possible output formats are RTF and HTML, offering no other formatting options. Since the add4Q||editor does not use hyperlinks, generated HTML pages are static.

Template files (*.dot) can be used for the output as MS Word document. You will find a sample template in the add4Q installation directory in the folder "..\examples\templates".

The included Microsoft Word template generates a front page, headers and footers, table of contents, list of tables, list of images, requirements list and the edited document content. All references to chapters, tables and images are active.

Using the placeholder string "{CONTENT}", you can define the position in the template where the actual document content will be inserted. This way, you could create indexes at the end of the document for example. If the "{CONTENT}" string is not found in a template, the document content will be placed at the end of the template by default.

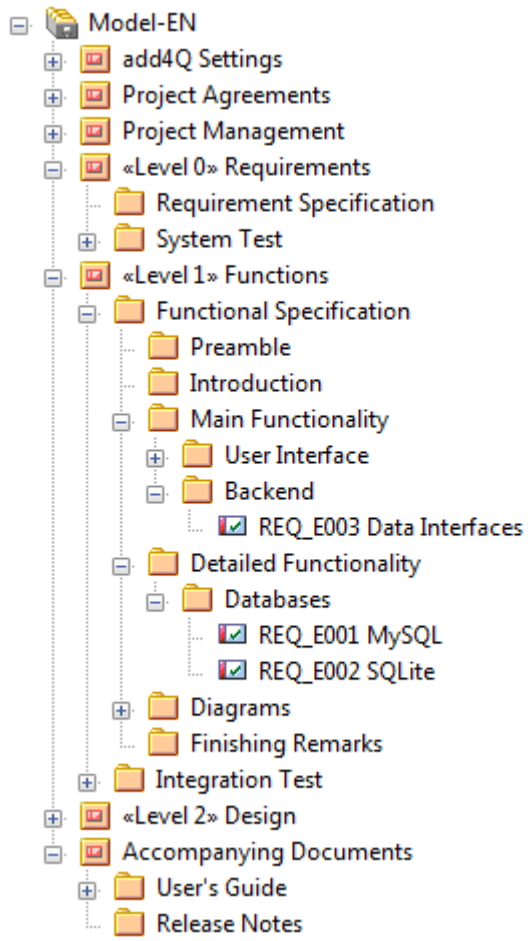
7.1.9 Create a document overview

After creating several documents, it is useful (sometimes even necessary) to create a list of the documents, including title, identification number and version. By selecting the corresponding icon a new document will be automatically generated with the name "[Index] – document directory" and displayed in the *library*.

7.2 Requirement management

Requirements are managed with the modules add4Q||linker, add4Q||tracer and add4Q||viewer which are interdependent according to their function. Precondition for the use of requirement management is that the development levels have been assigned to be able to link requirements throughout the levels and to make them traceable.

The following example shows a project with different levels, documents and classes, as displayed in the EA browser.



Project example with levels and requirements in the EA project browser

7.2.1 Linking rules

To create a complete system in terms of requirement engineering, each requirement has to be linked to an implementation and to at least one test case.

Required links:
Requirement is linked to the previous / next level.
A requirement is linked with at least one test case on the same level.
A test case is linked to a requirement on the same level.

Exceptions:
A requirement is realized with an artifact or text element which is not assigned to a trace level. In this case, the requirement does not have to be linked to the next level.

A requirement has been split or merged. In these cases, only the resulting products are linked. If, for example, requirement A has been split into requirement B and C, the products B and C are further linked, but not the basic requirement A.

A test case can also be realized with elements that are not assigned to a trace level.

Permitted links:
Splitting / merging of requirements on the same level.
Link with requirements and elements that are not assigned to a trace level.

Link direction:
The link direction in add4Q goes from the lowest to the next higher level. An example:
The realization (L2) meets the requirement of the technical specification (L1), the requirement of the technical specification (L1) meets the requirement of the requirement specification (L0).

See also Classification of trace problems.

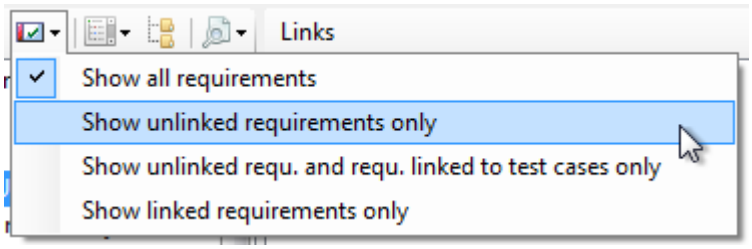
7.2.2 Link requirements

To link requirements with artifacts, the add4Q||linker user interface is started via the menu item [Extensions/add4Q/linker]. The aim is to link all requirements of a higher level with requirements on a lower level or with realizing document sections or classes.

The add4Q||linker user interface divides the project into three views:

Objects view
Contains all documents with included requirement objects, the marked requirement is loaded into the "links" window.

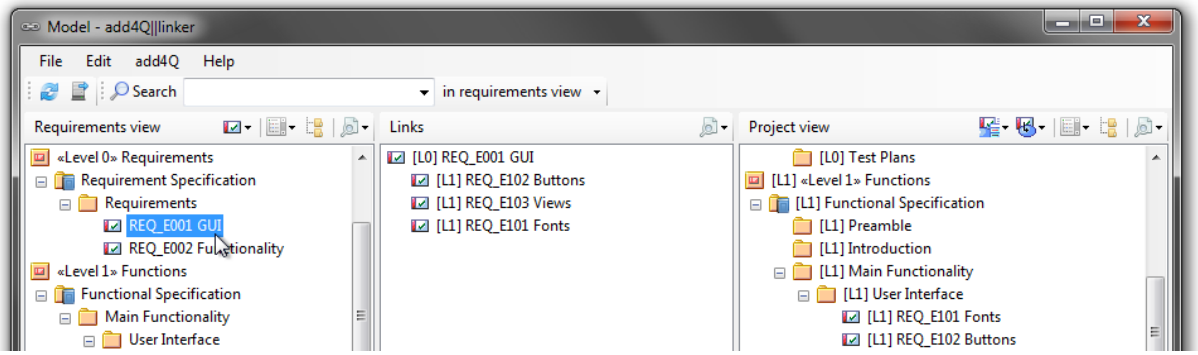
Filter options
With the icons in the objects view, the selection can be filtered and one can choose between display in list or tree form.


Links
Show all requirements
Show unlinked requirements only
Show unlinked requ. and requ. linked to test cases only
Show linked requirements only

Filter options in the objects view

Links
Here, all links of the requirement selected in the requirements window are shown and links with requirements, test cases and realizing objects are created.

Project view
This window contains the structure of all documents and artifacts of the current model, including subchapters, requirements, diagrams, classes and test cases. Similar to the objects view, there are also filter and display options.



Example in the add4Q||linker

Individual artifacts are linked according to the following procedure:

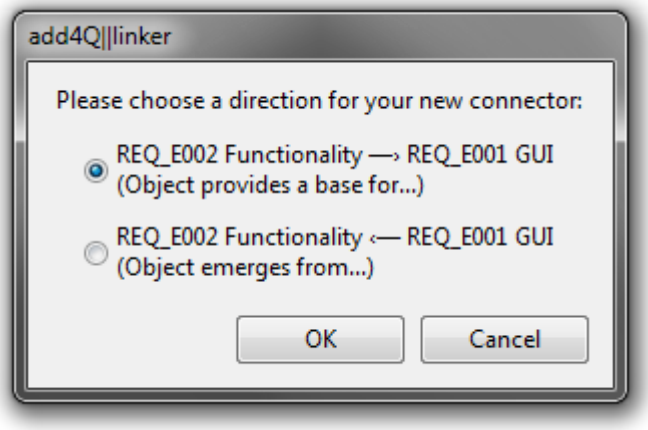
1. Through selection of a requirement in the left pane, the requirement is loaded into the "links" window. Possibly already existing links are displayed here.

2. In the project view window, an element of another level which is to be linked to this view is selected and dragged to the element in the links window. It is possible to select requirements, chapters of documents, artifacts, diagrams or objects of realization. Multiple selection is possible while holding the CTRL key.

Note: It is possible to select, for instance, requirements of level 1 and link them with elements of previous or following levels in a single operation. If already existing, test cases can of course be linked as well.

7.2.3 Split / merge requirements

It is possible to split or merge requirements by linking them to requirements on the same level. This leads to a question concerning the link relation.



Dialog box for splitting or merging of requirements

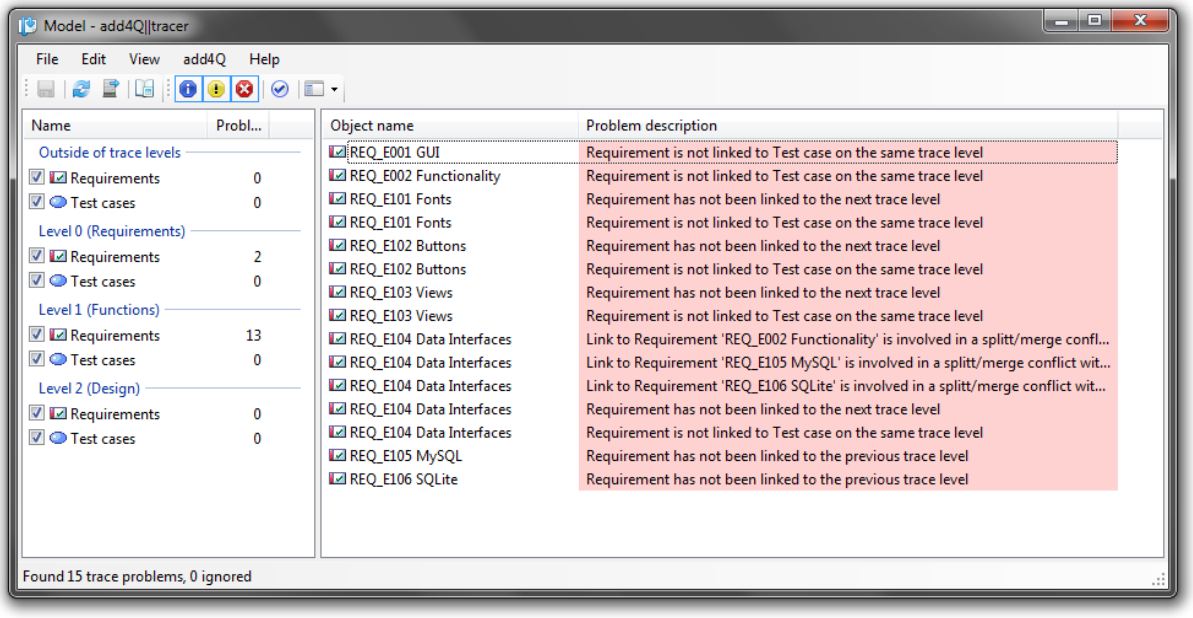
7.2.4 Check requirement links

To obtain a complete system of linked requirements, the following conditions have to be fulfilled:

All requirements of a level must be linked to at least one requirement of the next level or, in terms of realization, with a document section or class. All requirements within one level must be linked with at least one test case (see chapter Test management).

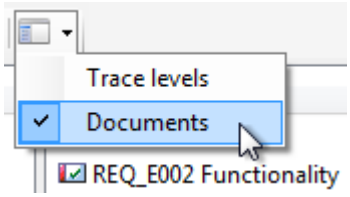
These conditions apply to all defined levels.

To check which elements are not yet linked, the add4Q||tracer is started via the menu item [Extensions/add4Q/tracer]. The window is structured in a way that unlinked requirements and test cases of each level can be displayed in an individual list. For each entry, a clear error message is shown.


Model - add4Q||tracer
File Edit View add4Q Help
Name Probl...
Outside of trace levels
Requirements 0
Test cases 0
Level 0 (Requirements)
Requirements 2
Test cases 0
Level 1 (Functions)
Requirements 13
Test cases 0
Level 2 (Design)
Requirements 0
Test cases 0
Object name Problem description
REQ_E001 GUI Requirement is not linked to Test case on the same trace level
REQ_E002 Functionality Requirement is not linked to Test case on the same trace level
REQ_E101 Fonts Requirement has not been linked to the next trace level
REQ_E101 Fonts Requirement is not linked to Test case on the same trace level
REQ_E102 Buttons Requirement has not been linked to the next trace level
REQ_E102 Buttons Requirement is not linked to Test case on the same trace level
REQ_E103 Views Requirement has not been linked to the next trace level
REQ_E103 Views Requirement is not linked to Test case on the same trace level
REQ_E104 Data Interfaces Link to Requirement 'REQ_E002 Functionality' is involved in a splitt/merge confl...
REQ_E104 Data Interfaces Link to Requirement 'REQ_E105 MySQL' is involved in a splitt/merge conflict wit...
REQ_E104 Data Interfaces Link to Requirement 'REQ_E106 SQLite' is involved in a splitt/merge conflict wit...
REQ_E104 Data Interfaces Requirement has not been linked to the next trace level
REQ_E104 Data Interfaces Requirement is not linked to Test case on the same trace level
REQ_E105 MySQL Requirement has not been linked to the previous trace level
REQ_E106 SQLite Requirement has not been linked to the previous trace level
Found 15 trace problems, 0 ignored

Default view of the add4Q||tracer with error output

Alternatively, trace errors can also be issued after being filtered by documents which allows employees to see only those issues relevant to them, or to distinguish hardware and software specific trace output.



View of the add4Q||tracer with document filter

Rationals
If there are trace errors in the model which should be ignored, you can assign them to a so-called rational. This can be done by using the context menu of the specific trace error. Trace errors which are assigned to rationals are not shown by default.

7.2.5 Classification of trace problems

Below, you will find some useful information for the tracing and handling of incidents causing an error message in the tracer.

Multiple requirement/test case descriptions:
Names are checked for consistency, a message is displayed according to your selection.

Multiple links:
In EA requirement diagrams it may happen that two trace links are created accidentally between requirements. With add4Q, only one link can be created between two requirements.

Linking with wrong direction:
Using add4Q the link direction is: L3 complies with L2, L3 complies with L1 etc. Or in other words: code complies with technical specification, technical specification complies with requirement specification.

Hazards that are linked to non-hazards:
Normally, a hazard element has to be linked to a hazard, i.e. a requirement having label hazard on level 0 has to be linked to hazard elements until realization.

An element getting the attribute hazard only on level 1 has to be linked to a hazard on level 2 but not on level 0.

Exceptions are test cases that cannot get a hazard label. The test engineer will recognize that the requirement to be tested is labelled as a hazard.

Requirements/test cases without trace level:
It is possible to create requirements and test cases in accompanying documents. In this way, a requirement can, for example, be realized with a text artifact in a user manual.

Links skipping the trace level:
With add4Q, it is impossible to skip levels. However, it is possible in EA to link a requirement of level 3 to a requirement on level 0.

Requirements that are not linked to the previous level:
Time and again, it will happen in practice that requirements are not created until realization. In terms of a complete system, these requirements have to be linked and accordingly created in the requirement specification and technical specification.

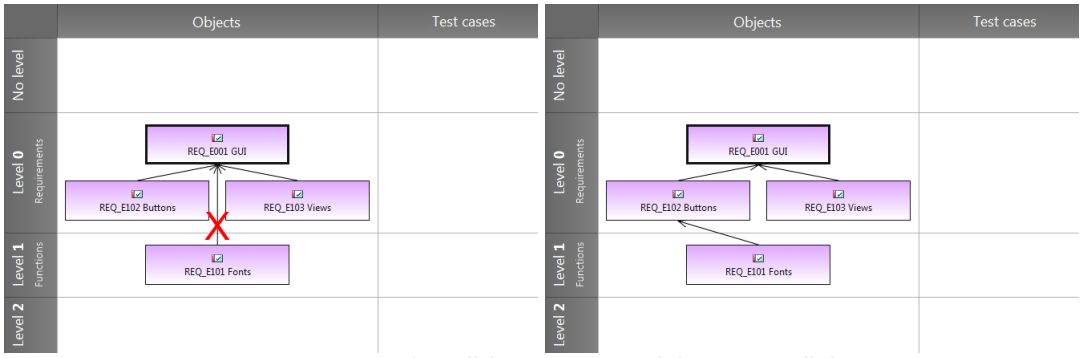
Requirements that are not linked to the next level:
Likewise, there could be requirements which do not have an equivalent on the next level or which are not yet linked.

Requirements with external link, without link to the next level:
External means a link to an element without trace level.

Requirements without test case link on the same level:
As in add4Q terms there may not be a requirement without test case, the selection box should then indicate an error.

Requirements/test cases that are linked to a wrong level:
See above. These errors are to be corrected in terms of a complete system.

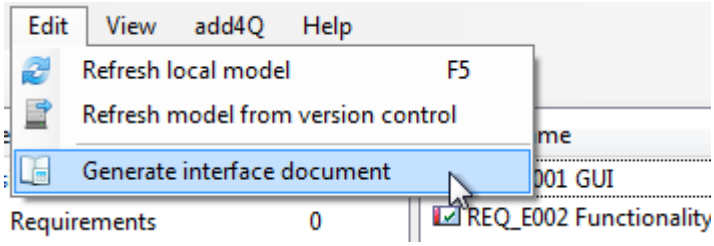
Split/merge errors:
This error message refers to an incorrect link. For instance, if requirement A was split into B and C and A was linked to the next level. The correct way is to link B and C.



Left: split/merge error; right: correct link

In-level split/merged requirement with test case linking:
Analogously to the above statement, the message refers to test cases related to a requirement. If, as in the example mentioned above, requirement A is additionally linked to test cases, these have to be linked to B and C. Accordingly, when being merged from C and B into A, test cases have to be linked on A.

7.2.6 Create trace report



Trace reports can be generated at any time by clicking the corresponding icon. After selecting the store package and the document name, the document is generated as a so-called interface document which can be further edited by means of the add4Q||editor, for example, to comment on a report or to adapt it to external demands.

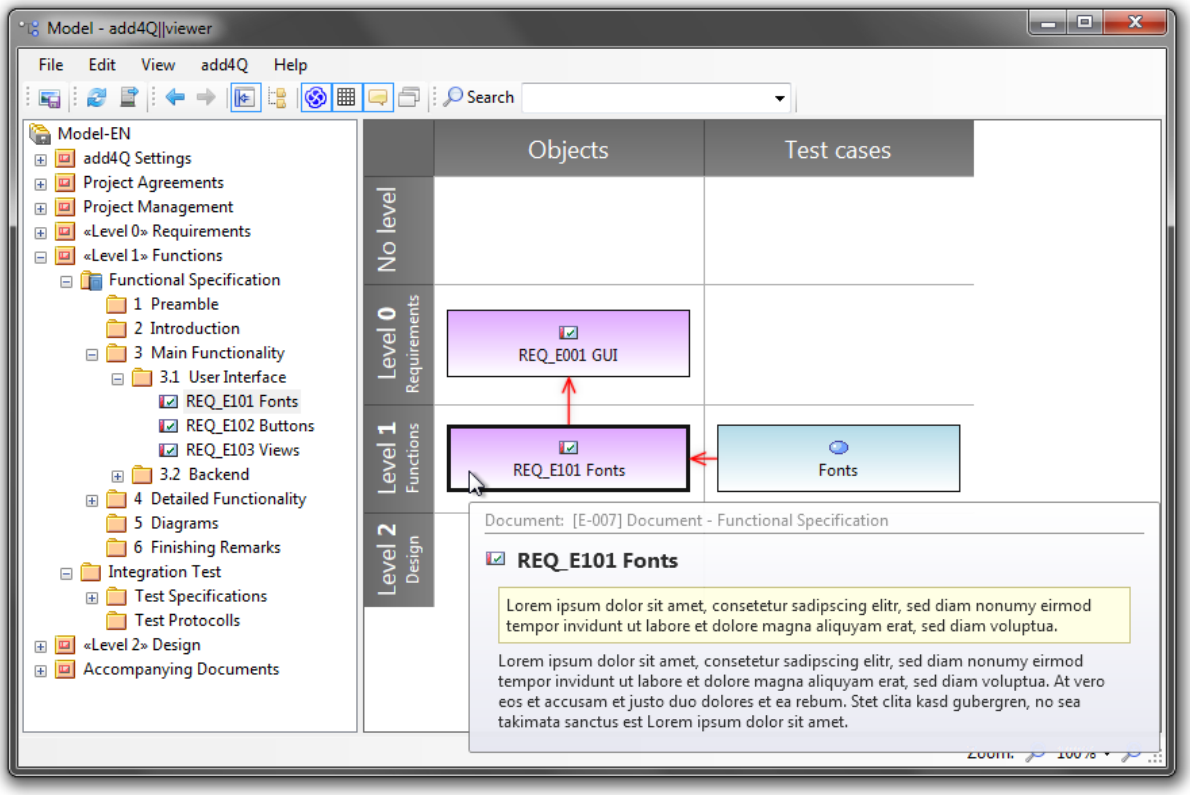
This list serves as an easy proof for all requirements to be covered by test cases and realizations through classes or document sections.

7.2.7 Visualization of requirement links

The add4Q||viewer is used to track single requirements with all of their links. It is started via the menu item [Extensions/add4Q/viewer]. The viewer always presents one element with all its links. In this way, you will get a complete overview of the relations of the element and, before changes, you can check which elements will be affected and possibly have to be adjusted.

The diagram is automatically updated with the selection of an entry in the add4Q||tracer, of an artifact in the add4Q||linker or add4Q||tester or of a requirement in the add4Q||editor. By selecting another element in the viewer, that element will be set active and its links will be displayed.

If you hover a diagram element with your mouse, a tooltip with the content of the element appears.


Model - add4Q||viewer
File Edit View add4Q Help
Search
Model-EN
add4Q Settings
Project Agreements
Project Management
«Level 0» Requirements
«Level 1» Functions
Functional Specification
1 Preamble
2 Introduction
3 Main Functionality
3.1 User Interface
REQ_E101 Fonts
REQ_E102 Buttons
REQ_E103 Views
3.2 Backend
4 Detailed Functionality
5 Diagrams
6 Finishing Remarks
Integration Test
Test Specifications
Test Protocolls
«Level 2» Design
Accompanying Documents
Objects
Test cases
No level
Level 0 Requirements
Level 1 Functions
Level 2 Design
REQ_E001 GUI
REQ_E101 Fonts
Fonts
Document: [E-007] Document - Functional Specification
REQ_E101 Fonts
Lorem ipsum dolor sit amet, consetetur sadipscing elitr, sed diam nonumy eirmod tempor invidunt ut labore et dolore magna aliquyam erat, sed diam voluptua.
Lorem ipsum dolor sit amet, consetetur sadipscing elitr, sed diam nonumy eirmod tempor invidunt ut labore et dolore magna aliquyam erat, sed diam voluptua. At vero eos et accusam et justo duo dolores et ea rebum. Stet clita kasd gubergren, no sea takimata sanctus est Lorem ipsum dolor sit amet.

Example of a linked requirement with associated test cases

The element which is grey-shaded in the screenshot represents a requirement with the "future" attribute which means that it will only become relevant in a future version.

Under the menu item [view] a grid can be displayed to clearly differentiate levels and test cases and to increase clarity. Likewise, the number of requirements listed next to each other can be limited.

7.3 Test management

The creation and editing of test cases is available in the plugin add4Q||tester which can be selected via the menu item [Extensions/add4Q/tester]. Analogous to the procedure used so far, test specifications and test plans are created as documents in which test cases are inserted as traceable elements including their descriptions.

A precondition for the use of the add4Q||tester is that the development levels have been assigned.

The testing process is divided into the following steps:

- creating test specifications
- creating test cases in the test specifications
- linking test cases with requirements
- creating test plans and assigning test cases
- entering test results
- creating test reports.

The add4Q||tester user interface consists essentially of four elements whose functions and names vary, depending on the action. In the execution stage [test specification] the window is structured as follows:

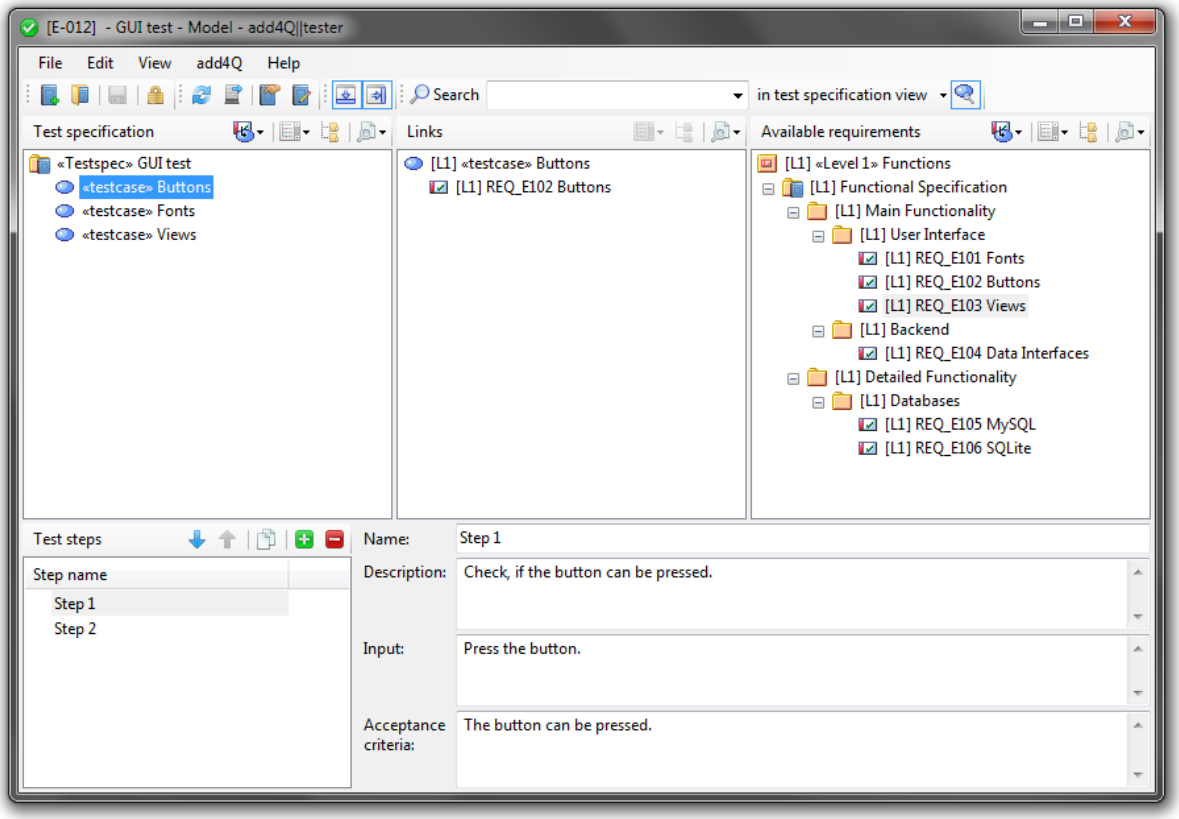
Window [test specification]
Serves for creating test specifications and test cases. Subsequently, it contains an overview of the predefined packages including the created test cases. One can switch between tree view and list view and also filter for one or the other so that only the unlinked test cases are shown.

Window [content of test case / test step]
Serves for creating test steps with detailed test instructions.

Window [links]
Displays always the active test case with its links and allows to link test cases to requirements.

Window [available requirements]
Shows all requirements of the level on which the test specification has been created. One can switch between tree view and list view and the requirements that are to be displayed can be filtered. There are the options to display

- all requirements,
- only unlinked requirements
- or only requirements which are not linked with test cases.



User interface of the add4Q||tester during editing

In the execution stage [test plan] , the visual structure remains the same, only the names and functions of the windows change.

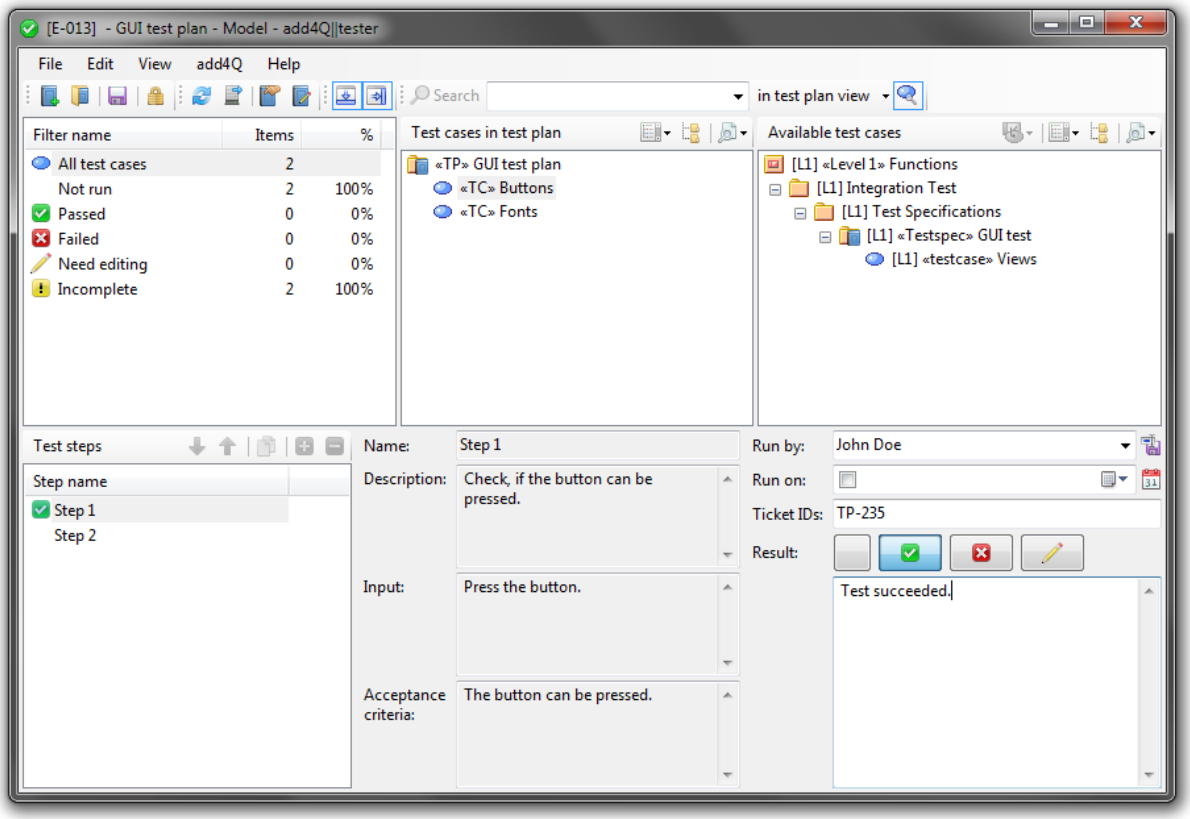
Window [test case filter]
Is used to create test plans and subsequently contains a statistical analysis of all test cases with their current status. This view also serves for filtering the test cases which are to be shown (all, open, passed, failed).

Window [test cases in the test plan]
Is used to add test cases to test plans and lists the filtered test cases of the statistical analysis. These can be activated for further processing.

Window [available test cases]
Displays all test cases available on the level that are not assigned to a test plan.

Window [content of test case / test step]

This window serves for entering the test results on the execution level [Test plan]. For this purpose, the name of the tester, the test date and the result of each test step are entered. Optionally, a note can be created for the test result. If testing was performed due to a bug ticket, the ticket ID can be entered.



View of the tester during execution phase of test plans

The following chapters describe the procedure for creating test specifications and test plans.

7.3.1 Create test specifications

The first step in test management is the creation of test specifications. The document is created via the menu [file/new/test specification]. In the following dialog, one selects the level on which the test specification is to be generated and creates the corresponding package.

This package is loaded in the [Test specification] window, where now other chapters and test cases can be added for further structuring. The requested action is chosen from the context menu of each chapter.

The following steps can be performed by selecting a test case in the [Test specification] window:

Create test steps
The required test steps can be created in the [test steps] window by selecting the icon "New step". The description of the test case, input parameters and acceptance criteria are released for this step and will be saved when you exit.

Test steps can be copied and their order can be changed.

Assign test cases to requirements
By selecting a test case in the [Test specification] window, this test case is displayed in the [Links] window and can there be linked to requirements. Therefore, you choose the desired requirement in the [Available requirements] window and drag it to the test case. Multiple selection is possible while holding the <CTRL> key.

Incorrect links are removed by marking them and pressing the <Delete> key.

7.3.2 Create test plans

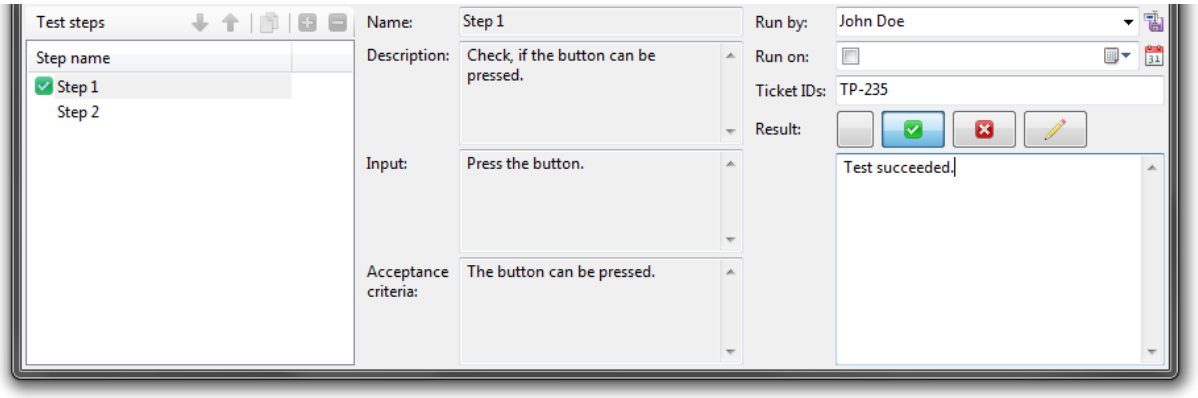
After the definition of the test cases in the specification, the test plans can now be created. The procedure for creating a test plan is equal to creating the test specification. The test plan generated that way is loaded into the [Test cases in the test plan] window and can then be filled with test cases.

Add test cases to the test plan
In the [Available test cases] window all test cases from the test specifications available on this level are shown and can be added to the test plan by dragging them into the test cases window. You can switch between a tree and list view in the available test cases window.

7.3.2.1 Processing of test plans

The test cases to be executed are displayed in the [Test cases in the test plan] window by means of the selected filter. By selecting a test case, the test steps to be fulfilled are being shown in the bottom half of the screen.

The selection of a test step shows the description and acceptance criteria and makes results fields editable. For this purpose, the tester enters his name and the test date, comments on the test run, if necessary, and sets the status. Possible options are Edit, Passed and Failed.



Test window during execution phase of test cases

To update the number of open / passed and failed test cases, the window has to be reloaded via the Update button.

Note: Click on "Edit name" in the field "tested by" to create a list of names of all the testers, or at least to enter their names.

7.3.2.2 Create a test protocol

Test protocols can be created any time and very easily with the add4Q editor by opening the desired test specifications or test plans. All information that is displayed in different panes in the tester, can be found in a properly formatted, easy-to-read table.

The document can be generated as Word, RTF or HTML document with the option [File/export file].

«TC» Buttons

1. Step 1	
Description:	Check, if the button can be pressed.
Input:	Press the button.
Acceptance criteria:	The button can be pressed.
Ticket ID:	TP-235
Result:	Test succeeded.
Status:	Pass
Tested by:	John Doe

Extract from a test protocol

The protocol contains all information gathered during the test cycle on tested modules, test cases, personnel responsibilities, timing and results. The green or red marking on the test step shows at first glance whether the step passed or failed.

7.4 Perform reviews

Reviews are important processes for the assessment, correction and subsequent release of documents.

Roles of those involved in the review process

- Review manager (usually the author of the document) who coordinates and chairs the review meeting.
- Author of the document.
- Review participants who examine the document and make comments.
- Release manager who confirms the validity of the document by his signature at the end of the review.

Precondition for the execution of a review

For the storage of review protocols, it is necessary to create a specific log directory where all review protocols for the documents of the project are being collected. See chapter Definition of the review protocol directory.

The dialog to create the directory will be displayed automatically when the storage of review results is required for the first time and the log directory has not yet been created at that time.

Division of the review process into phases

The execution of a document review is divided into several phases, some of which are optional.
- Phase 0: Pre-review, carried out by a number of review participants (optional)
- Phase 1: Review discussion with review manager, author and review participants (mandatory)
- Phase 2: Correction according to the results of the review by the author (optional, depending on the review result)
- Phase 3: Release of document by the release manager (mandatory).

Digital signatures

The digital signature will be applied in review management. Review protocols and the underlying documents usually have to be signed by the author and the release manager. This can be made either conventionally by printing out the corresponding form and manually signing the cover sheet, or by using a digital signature stored in the system.

With the add4Q||reviewer documents can be digitally signed if a personal signature of the employee concerned is stored in the certificate storage of Windows operating system on his/her computer. With the Windows login, the signature is clearly associated with and only accessible to the user logged in.

7.4.1 Phase 0: Pre-reviews (optional)

Preparation of the review
A review usually begins with the review manager asking the participants to read the document to be examined and to check it for errors, necessary additions etc. All changes are to be collected and discussed until the actual review date.

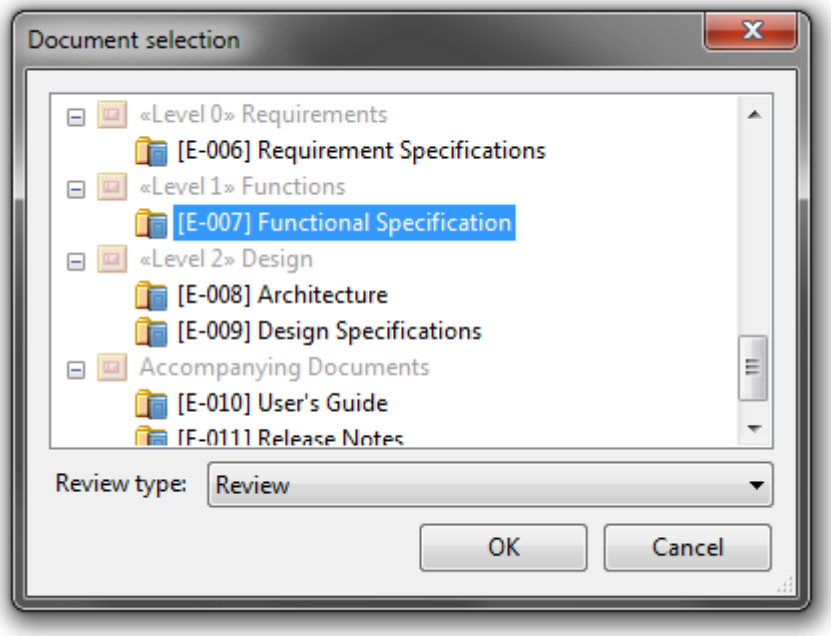
The participants may write comments in the document to be reviewed, edit the linked document and insert notes. These changes are NOT saved in the original document but are stored as a new document in the review directory for the next review to come.

The following chapters describe the pre-review process.

7.4.1.1 Selection of documents

Each review process is started by selecting the menu item [extensions/add4Q/reviewer]. In a first dialog,

the user will be asked to choose the document to be reviewed and then the desired action, in case of a pre-review by pressing the "Start pre-review" button.



Start dialog of the add4Q||reviewer

7.4.1.2 Entering participant name

The first time the application is started, the tabcard "General" is displayed where the name of the review participant is entered. This name will later appear when comparing individual pre-review comments in the actual review meeting.

If a document has already been released in a review, only those elements are being shown which have been changed since the last release.

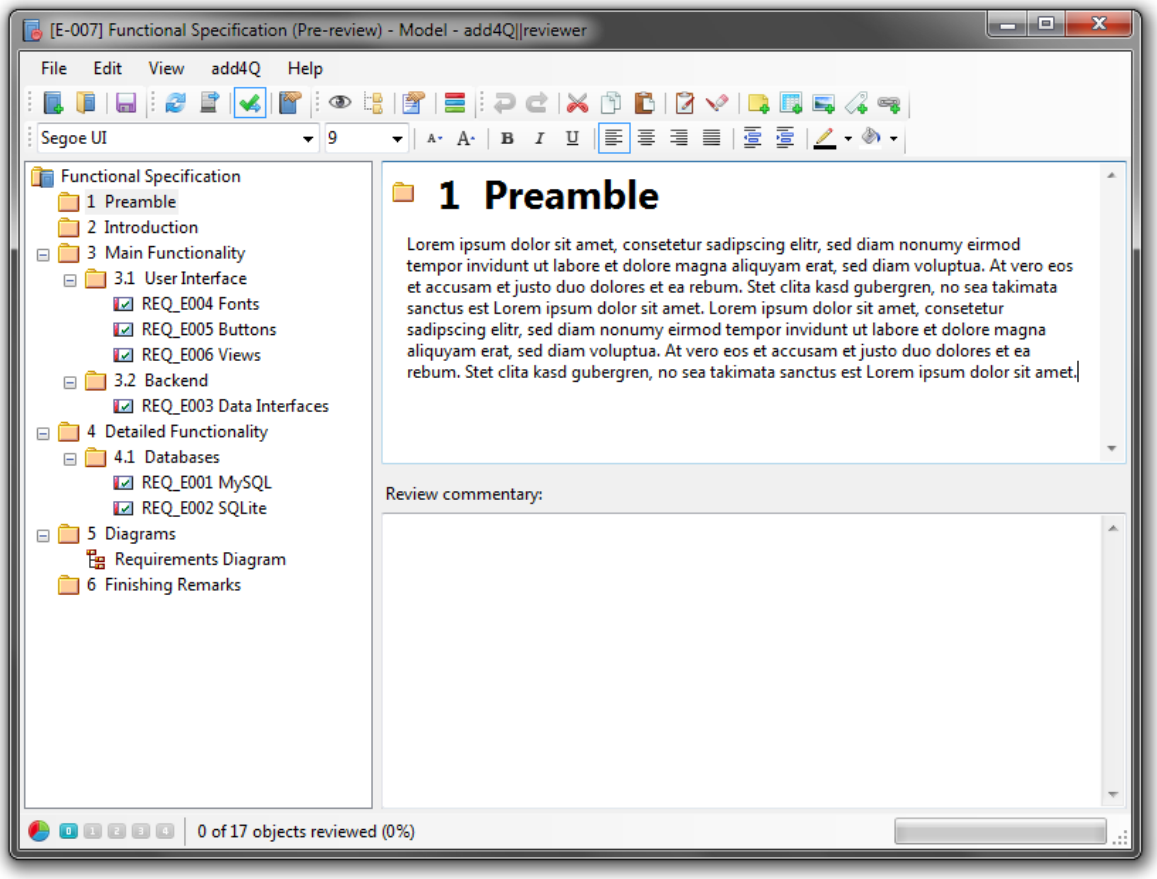
7.4.1.3 add4Q||reviewer window structure

The user interface of add4Q||reviewer is divided into 3 parts. In the left part, you can see all of the objects from your model in a tree view. This tree view is used for navigating through the document. If the document contains objects which are already approved, they will not be shown here.

The rich text editor in the upper left portion of the window is used for editing the contents of the selected object. These changes can then optionally be applied in phase 1 of the review.

In the lower right text box, you can enter a commentary which should describe the changes you made to the content or the changes that you think will need to be made.

Objects with a commentary will be shown with a "pencil" icon in the tree view. Objects with changed content will have a green background color.


[E-007] Functional Specification (Pre-review) - Model - add4Q||reviewer
File Edit View add4Q Help
Segoe UI
9
Functional Specification
1 Preamble
2 Introduction
3 Main Functionality
3.1 User Interface
REQ_E004 Fonts
REQ_E005 Buttons
REQ_E006 Views
3.2 Backend
REQ_E003 Data Interfaces
4 Detailed Functionality
4.1 Databases
REQ_E001 MySQL
REQ_E002 SQLite
5 Diagrams
Requirements Diagram
6 Finishing Remarks
1 Preamble
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Review commentary:
0 of 17 objects reviewed (0%)

Reviewer window during a pre-review

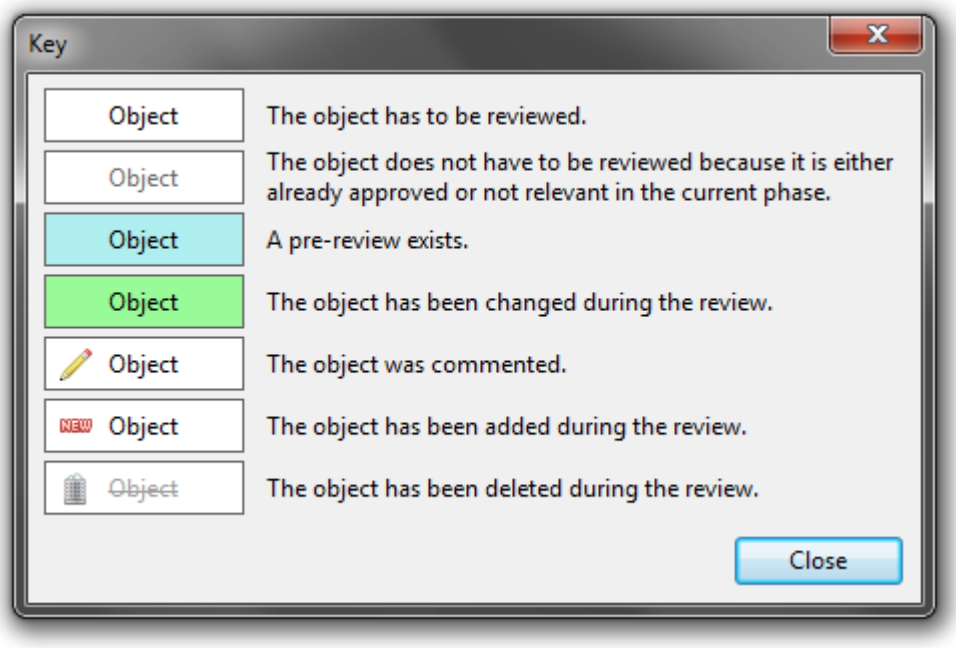
Toolbar
The most important buttons in the toolbar include:

"Refresh" detects changes in the model made outside of the reviewer window (e. g. editor or Enterprise Architect) and shows them in reviewer.

"Expand all" expands all tree view nodes.

"Show all objects" shows objects even if they are already approved. You can add these already approved items to the review through the context menu.

"Key" contains descriptions on the meaning of the tree view colors/icons.


Key
Object
The object has to be reviewed.
Object
The object does not have to be reviewed because it is either already approved or not relevant in the current phase.
Object
A pre-review exists.
Object
The object has been changed during the review.
Object
The object was commented.
Object
The object has been added during the review.
Object
The object has been deleted during the review.
Close

Tree view key

Pausing or finishing a pre-review
A (pre-)review can be suspended at any time. When you save, the current state will be stored in the model and the review can be continued later using the [File/Open] menu item.

7.4.2 Phase 1: Discussion of review (mandatory)

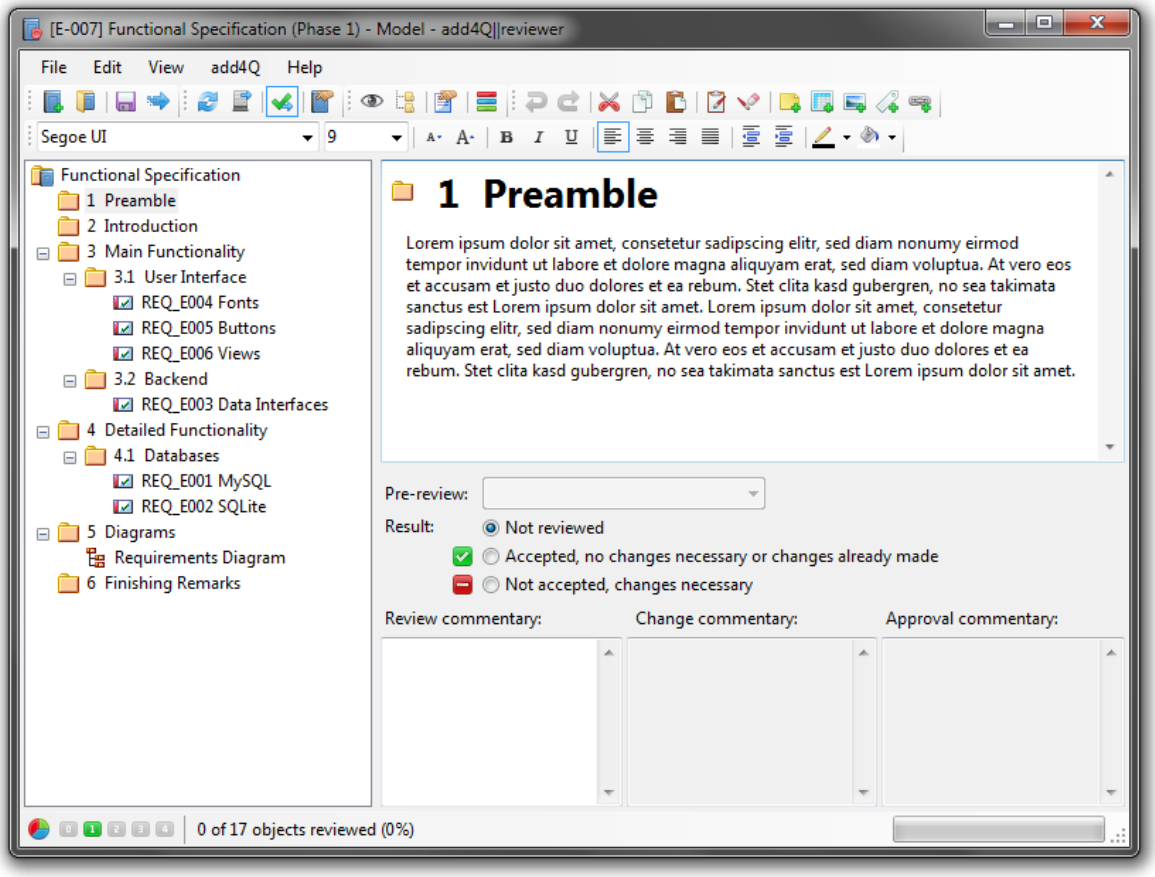
After the (optional) performance of single pre-reviews, the actual review meeting will be initiated by the review manager together with the author and the participants.

When the review is started, a windows pops up where you can enter review properties such as participants, digital signatures and general notes.

Window structure
Similar to the pre-review, the left tree view contains all objects that need to be reviewed. Also, the top right view is used to display object contents, such as the chapter text, notes or object properties.

The review window also contains a dropdown box for selecting any pre-reviews that may exist in your model, as well as radio buttons used to specify the outcome of the review for the selected object. You can choose between "Not reviewed", "Accepted" and "Not accepted."

The lower part contains text boxes where you can choose to enter additional comments specific to the selected object.


[E-007] Functional Specification (Phase 1) - Model - add4Q||reviewer
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Pre-review:
Result:
Not reviewed
Accepted, no changes necessary or changes already made
Not accepted, changes necessary
Review commentary:
Change commentary:
Approval commentary:
0 of 17 objects reviewed (0%)

User interface of the add4Q||reviewer in review mode

Changes and comments from a pre-review

Whenever a pre-review for a specific object exists, the object is shown with a turquoise background in the tree view.

After you select a pre-review from the dropdown box, the changed object contents as well as the commentary that was entered in the pre-review will be shown on screen in a turquoise border.

To view the differences between the original object and the object from the pre-review, you can use the "Mark differences" button. Differences between both objects will be highlighted.

You can synchronize scrolling between both windows to make comparing the contents easier.

You can apply the contents or commentary from the pre-review to the object by pressing the tick buttons.

General approach

1.) Similar to the pre-review, changed to objects can be made directly in the text box. You can also write a commentary to clarify what you were doing.

2.) Subsequently, you have to decide whether or not to "Accept" the object in its current state. An object should be accepted if no further changes need to be made to it.

This needs to be done with every object in the review.

Note: The Feature "Automatically go to next object" automatically selects the next object after you choose "Accepted" or "Not accepted."

You can also change the "Accepted" status of multiple objects at once using the tree view context menu.

If you finished reviewing all objects and want to end the current review phase, click on the "Finish phase" button. If you have not reviewed all objects yet but want to continue later, you can use the "Save" button and continue the review at a later time.

7.4.3 Phase 2: Correction from review results (optional)

If during phase 1 corrections to the document have been noted down which are yet to be made, the correction phase will be initiated by the author with continuing the review process.

In the tree view, only objects which have been marked as "Not accepted" in phase 1 will be shown. You need to make any additional changes to these objects before continuing to the next phase.

Note: Objects which are not shown in this phase (because they have been marked as "Accepted" in phase 1, for example) can be displayed using the "show all objects" button.

7.4.4 Phase 3: Release (mandatory)

In the last phase of the review the release manager has to verify the changes made on the basis of the comments and the current text.

After reviewing the corrections, the release manager completes the review and writes a comment that is entered in the document history. Finally, the document is signed with a digital signature or printed out and signed by hand. With that, the document will be archived and frozen in its current version. Further editing can only be made in a new document version. A new version is automatically generated upon completion of the phase.

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8.2 Contact

You will find further information on all topics in the add4Q online help. We will be glad to hear from you if you have any additional questions or suggestions for improving our product.

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